H640-3

102d Congress, 1st Session - - - - - - - - - - - - House Document 102-42

xv+365p il

BAYOU LA BATRE, ALABAMA

380p.

COMMUNICATION

FROM

THE ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY DATED AUGUST 3, 1989, SUBMITTING A REPORT TOGETHER WITH ACCOMPANYING PAPERS AND ILLUSTRATIONS, ON BAYOU LA BATRE, ALABAMA

996-A;
996-B

Y1.1/7: 102-42.

FEBRUARY 20, 1991—Referred to the Committee on Public Works and Transportation and ordered to be printed with illustrations

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U.S. GOVERNMENT PRINTING OFFICE
39-777 WASHINGTON : 1991

126

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LETTER OF TRANSMITTAL

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY
WASHINGTON, DC 20310-0103

REPLY TO
ATTENTION OF

01 FEB 1991

Honorable Thomas S. Foley
Speaker of the House
  of Representatives
Washington, D. C. 20515

Dear Mr. Speaker:

Section 101(a) of the Water Resources Development Act of 1990 authorized the modification of the existing Federal navigation project at Bayou La Batre, Alabama. The Secretary of the Army supports the authorization and plans to implement the project through the normal budget process.

The project is described in the report dated August 3, 1989, from the Chief of Engineers, copy enclosed. The reports of the Board of Engineers for Rivers and Harbors and district and division engineers are also provided. These reports were prepared in response to a resolution adopted October 10, 1974, by the Committee on Public Works of the United States House of Representatives. Preconstruction engineering and design activities for this project will be continued under the authority provided by the October 10, 1974, resolution.

The views of the States of Alabama and Mississippi, the Departments of the Interior, Agriculture, and Transportation, and the Environmental Protection Agency are set forth in the report. Both States support the project and the Federal agencies do not object to implementation.

The authorized plan is the national economic development plan and provides for the deepening and widening of channels in the Gulf Intracoastal Waterway, Bayou La Batre, and Snake Bayou, in Mississippi and Alabama. The total length of the project is about 23 miles. Based on October 1989 price levels, the estimated first cost of the improvements is $16,230,000, of which $4,490,000 would be Federal.

Implementation of the project will be subject to cost sharing, financing, and other requirements of law as described on pages 7 and 8 of the report of the Board of

Engineers for Rivers and Harbors. Implementation will be further subject to the addition of local cooperation item 20c on page 8 which addresses non-Federal responsibilities for hazardous materials. Specifically, the non-Federal sponsor will be required to:

> "c. Assume complete financial responsibility for the cleanup of any hazardous materials located on project lands (including submerged lands) and regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and be responsible for operating, maintaining, repairing, replacing, and rehabilitating the project in a manner so that liability will not arise under CERCLA."

The Office of Management and Budget advised that there is no objection to the submission of the report to the Congress. A copy of its letter is enclosed in the report.

Sincerely,

G. Edward Dickey
Acting Assistant Secretary of the Army
(Civil Works)

Enclosure

COMMENTS OF THE OFFICE OF MANAGEMENT AND BUDGET

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

21 SEP 1990

Honorable Robert W. Page, Sr.
Assistant Secretary of
the Army (Civil Works)
Room 2E570 - Pentagon
Washington, D.C. 20310-0103

Dear Mr. Page:

As required by Executive Order 12322, we have completed our review of your recommendation and the report on modifications to the navigation project at Bayou La Batre, Alabama, enclosed with your letter of September 27, 1989.

The Office of Management and Budget does not object to your submitting this report to Congress. The recommendation is consistent with the program of the President, contingent upon project authorization and funding in accordance with the cost-sharing provisions of P.L. 99-662.

Sincerely,

Robert E. Grady
Associate Director
for Natural Resources,
Energy and Science

COMMENTS OF THE STATE OF ALABAMA

Alabama Department of Economic And Community Affairs

GUY HUNT
GOVERNOR

FRED O. BRASWELL, III
DIRECTOR

February 6, 1989

Major General George K. Withers, Jr.
Chairman, Board of Engineers for Rivers
and Harbors
ATTN: CEBRH-EV
Kingman Building
2593 Leaf Road
Fort Belrain, Virginia 22060-5576

Dear General Withers:

As you requested we have reviewed the district engineers report and final environmental impact statement and the proposed report of the Chief of Engineers (transmitted under letter dated November 1, 1988) concerning proposed improvements in the navigation channel at Bayou La Batre, Alabama.

This office concurs in the proposed report of the Chief of Engineers. This project with a very favorable benefit-cost ratio should, in addition to enhancing national economic development, greatly assist the central gulf region in utilizing its resources with minimal environmental impact.

Please keep us informed on this project and if we can be of further assistance please feel free to call on us.

Sincerely,

Fred O. Braswell, III
Director

COMMENTS OF THE STATE OF MISSISSIPPI

STATE OF MISSISSIPPI
OFFICE OF THE GOVERNOR

JOHN HORHN
Executive Director
Federal-State Programs

MARY BUCKLEY
Director
Department of Planning and Policy

MEMORANDUM

TO:
Department of the Army
Board of Engineers
Kingman Building
Fort Belvoir, VA 22060-5576

DATE: December 6, 1988

FROM: STATE CLEARINGHOUSE FOR FEDERAL PROGRAMS

SUBJECT: REVIEW COMMENTS
Activity: Proposed report of the Chief of Engineers on Bayou La Batre, Alabama, with the report of the District Engineer and Final Environmental Impact Statement (FEIS).

State Application Identifier Number: MS881121-002R

Location: Jackson/Southern

Contact: Maj. Gen. George K. Withers, Jr.

The State Clearinghouse, in cooperation with state agencies interested or possibly affected, has completed the review process for the activity described above.

INTERGOVERNMENTAL REVIEW PROCESS COMPLIANCE:

- ☐ We are enclosing the comments received from the state agencies for your consideration and appropriate action. The remaining agencies involved in the review did not have comments or recommendations to offer at this time. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.
- ☐ Conditional clearance pending Archives and History's approval.
- ☑ None of the state agencies involved in the review had comments or recommendations to offer at this time. This concludes the State Clearinghouse review, and we encourage appropriate action as soon as possible. A copy of this letter is to be attached to the application as evidence of compliance with Executive Order 12372 review requirements.
- ☐ The review of this activity is being extended for a period not to exceed 60 days from the receipt of notification to allow adequate time for review.

COASTAL PROGRAM COMPLIANCE (Coastal area activities only):

- ☐ The activity has been reviewed and complies with the Mississippi Coastal Program. A consistency certification is to be issued by the Bureau of Marine Resources in accordance with the Coastal Zone Management Act.
- ☐ The activity has been reviewed and does not comply with the Mississippi Coastal Program.

cc: Funding Agency (As requested by applicant)

COMMENTS OF THE DEPARTMENT OF THE INTERIOR

United States Department of the Interior
OFFICE OF ENVIRONMENTAL PROJECT REVIEW
WASHINGTON, D.C. 20240

January 19, 1989

ER 88/961

Lieutenant General H. J. Hatch
Chief of Engineers
ATTN: CECW-PM
Department of the Army
Washington, D.C. 20314-1000

Dear General Hatch:

Thank you for the letter of November 1, 1988, requesting our views and comments on the proposed report of the Chief of Engineers and the final environmental statement for Bayou LaBatre, Mobile County, Alabama.

The documents provide a satisfactory discussion of the natural resources within the project area and the expected impacts of the recommended project. Athough, the Fish and Wildlife Service has some concerns regarding the details of dredged material disposal at Isle aux Herbes, they would be more appropriately addressed during the upcoming Planning and Engineering Development phase of this project.

Sincerely,

Bruce Blanchard, Director

COMMENTS OF THE DEPARTMENT OF TRANSPORTATION

U.S. Department
of Transportation
**United States
Coast Guard**

Commandant
United States Coast Guard

Washington, D.C. 20593-0001
Staff Symbol: G-MP-1
Phone: (202) 267-0389

NOV 7 [illegible]

Major General George K. Withers, Jr.
Chairman, Board of Engineers for Rivers and Harbors
ATTN: CEBRH-EV
Kingman Building, 2593 Leaf Road
Fort Belvoir, Virginia 22060-5576

Dear General Withers:

We have reviewed the proposed report of the Chief of Engineers on Bayou La Batre, Alabama, other pertinent reports and final environmental impact statement (FEIS). We have no comments to offer.

Thank you for giving us the opportunity to review the reports and FEIS on Bayou La Batre, Ala.

Sincerely,

J. E. Lindak

J. E. LINDAK
Captain, U. S. Coast Guard
Chief, Planning Staff
By direction of the Commandant

COMMENTS OF THE DEPARTMENT OF AGRICULTURE

DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20250

February 8,1989

Major General George K. Withers, Jr.
Chairman, Board of Engineers for Rivers and Harbors
ATTN: CEBRH-EV
Kingman Building, 2593 Leaf Road
Fort Belvoir, Virginia 22060-5576

Dear General Withers:

This is in response to the letter dated November 1, 1988 from John M. McCann, Jr., Acting Resident Member, Board of Engineers for Rivers and Harbors, requesting our review and comment on the proposed report of the Chief of Engineers and other reports on Bayou La Batre, Alabama.

The Chief of Engineers is proposing to concur with the recommendations of the District Engineer, Mobile District, that the existing federal navigation project for Bayou La Batre be modified to provide about 23 miles of improved channel. The present project depth of 12 feet would be increased to 18 feet from the Pascagoula Ship Channel east along the Gulf Intracoastal Waterway, north to the mouth of Bayou La Batre, and through the existing turning basin. A 14-foot depth side channel would be provided up Snake Bayou for 500 feet.

The recommended plan is the designated National Economic Development plan. Estimated first cost of the improvements is $17,644,000 of which $4,590,000 are federal and $13,054,000 are nonfederal. Average annual benefits are estimated at $4,902,000 and annual charges at $2,189,000. The resulting benefit-cost ratio is 2.2.

We have no objection to the report of the Chief of Engineers and its concurrence with the recommendations of the District Engineer.

Sincerely,

Geo. S. Dunlop

GEORGE S. DUNLOP
Assistant Secretary
Natural Resources and Environment

COMMENTS OF THE ENVIRONMENTAL PROTECTION AGENCY

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

4PM-EA/GJM

Major General George K. Withers,Jr.
Chairman, Board of Rivers and Harbors
U.S. Army Corps of Engineers
Fort Belvoir,VA 22060-5576

ATTENTION: CE-B-RH-EV

SUBJECT: Feasibility Report and Environmental Impact Statement for
Navigation Improvements at Bayou La Batre, Alabama
EPA Log No.: F-COE-E32068-AL

Dear General Withers:

EPA, Region IV has reviewed the above referenced document on the proposed maintenance dredging and disposal activities for the Bayou La Batre Navigation Project in Alabama. As a result of our review, we find our initial comments to the proposal were satisfactorily addressed.

If we can be of further assistance, please contact Dr. Gerald Miller of the review staff at 404-347-3776.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Acting Chief
NEPA Review Staff
Environmental Assessment Branch

BAYOU LA BATRE, ALABAMA

REPORT OF THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY

DEPARTMENT OF THE ARMY
OFFICE OF THE CHIEF OF ENGINEERS
WASHINGTON, D.C. 20314-1000

REPLY TO
ATTENTION OF:

CECW-PM (10-1-7a)

August 3, 1989

SUBJECT: Bayou La Batre, Alabama

THE SECRETARY OF THE ARMY

1. I submit for transmission to Congress my report on Bayou La Batre, Alabama. It is accompanied by the reports of the Board of Engineers for Rivers and Harbors and the district and division engineers. These reports are in response to a resolution adopted 10 October 1974 by the Committee on Public Works of the United States House of Representatives requesting a review of past reports to determine whether any modification of the Federal project at Bayou La Batre is advisable to meet present and anticipated requirements of navigation.

2. The district and division engineers recommend that the existing Federal project for Bayou La Batre be modified to provide: (a) an 18-foot-deep by 120-foot-wide channel from Pascagoula Ship Channel east along the Gulf Intracoastal Waterway and then north to the mouth of Bayou La Batre; (b) an 18-foot-deep by 100-foot-wide channel up Bayou La Batre through and including the existing turning basin with a transition to a 14-foot-deep by 75-foot-wide channel to a point 1,500 feet above the Highway 188 bridge; and (c) a 14-foot-deep by 50-foot-wide side channel up Snake Bayou for 500 feet and then a 12-foot-deep by 50-foot-wide channel for an additional 800 feet. The total length of improved channel would be about 23 miles. Dredged material from the Bayou La Batre channel would be placed in upland disposal areas. Material from the mouth of Bayou La Batre to the Pascagoula Ship Channel would be placed partly on the shoreline of Isle aux Herbes and partly in open water. There are no significant environmental concerns. The placement of material along the shoreline of Isle aux Herbes would help to protect the existing marshes from erosion.

3. The reporting officers' recommended plan is the national economic development plan. A greater project depth will improve the efficiency of shipbuilding and repair operations, eliminate delays to fishing vessels awaiting favorable tides, reduce the number of vessel groundings, and allow the use of larger, more

efficient fishing vessels. Based on October 1988 price levels, the estimated first cost of the improvements is $15,072,000 of which $3,851,000 is Federal and $11,221,000 is non-Federal. Based on 8 7/8 percent interest rate and 50-year period of analysis, average annual benefits are estimated at $5,988,700, and average annual costs are $2,247,300. The resulting benefit-cost ratio is 2.70.

4. The Board of Engineers for Rivers and Harbors concurs in the findings and recommendations of the reporting officers and in the technical review findings of the Washington Level Review Center resulting from the concurrent Washington level review process. The proposed navigation improvements are technically sound, economically justified, and environmentally and socially acceptable. Accordingly, the board recommends that the navigation project for Bayou La Batre, Alabama, be authorized for implementation generally in accordance with the reporting officers' recommended plan.

5. I concur in the findings, conclusions, and recommendations of the board.

6. The recommendations contained herein reflect policies governing formulation of individual projects and information available at this time. They do not necessarily reflect program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works construction program. Consequently, I acknowledge that the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, the sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further prior to transmittal to the Congress.

H. J. HATCH
Lieutenant General, USA
Chief of Engineers

REPORT OF THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

DEPARTMENT OF THE ARMY
BOARD OF ENGINEERS FOR RIVERS AND HARBORS
KINGMAN BUILDING
FORT BELVOIR, VIRGINIA 22060-5576

REPLY TO
ATTENTION OF:

CEBRH (10-1-7a) 16 June 1989

SUBJECT: Bayou La Batre, Alabama

Chief of Engineers
Department of the Army
Washington, DC 20314-1000

SUMMARY OF BOARD ACTION

The board concurred in the reporting officers' plan for deep-draft navigation improvements at Bayou La Batre, Alabama. The board finds that the improvements are technically sound, economically justified, and environmentally and socially acceptable. Proposed improvements within the bayou include: (1) Deepening the existing 12-foot-deep by 100-foot-wide channel and turning basin to 18 feet; (2) deepening the existing 12-foot-deep by 75-foot-wide channel to 14 feet; (3) extending a new 14-foot-deep by 75-foot-wide channel above the Highway 188 bridge; and (4) extending a new 14-foot-deep by 50-foot-wide channel up Snake Bayou, a tributary of Bayou La Batre. The improvements within Mississippi Sound include modifying the existing 12-foot-deep by 100-foot-wide channel to 18 feet deep by 120 feet wide and extending along the same alignment to the Gulf Intracoastal Waterway, and then west along the intracoastal waterway to the existing Pascagoula Ship Channel. Dredged material from within the bayou would be placed in upland disposal sites. Some dredged material from Mississippi Sound would be used to construct a berm to protect wetlands at Isle aux Herbes. The remainder would be placed in open water greater than 12 feet deep using thin-layer techniques. The elimination of delays to fishing vessels awaiting favorable tides, the reduction in groundings for vessels risking shallow water conditions, and the ability to use larger, more efficient vessels will benefit seafood harvesting and processing. Greater project depths also will provide operational savings for shipbuilding and repair and allow construction and servicing of deeper-draft vessels. The first cost of the proposed plan is estimated at $15,072,000, based on October 1988 price levels, and the benefit-cost ratio is 2.7.

SUMMARY OF REPORT UNDER REVIEW

1. AUTHORITY. This report is in final response to a resolution adopted 10 October 1974 by the Public Works Committee of the United States House of Representatives. The committee requested the Board of Engineers for Rivers and Harbors to determine the advisability of modifying the existing project in any way at this time. The resolution is quoted in the district engineer's report.

2. STUDY AREA AND ECONOMIC DEVELOPMENT. Bayou La Batre, Alabama, is located off Mississippi Sound on the Gulf of Mexico in the extreme southwestern corner of Mobile County, Alabama, about 35 miles southwest of the city of Mobile. The city of Bayou La Batre bears the name of the bayou along ~~which it is located. Since incorporation in~~ 1955, the city of Bayou La Batre, with a land area of 3.7 square miles, has had a relatively stable population, with some population fluctuation paralleling the oil exploration industry economy. The 1984 population was 2,162, compared to an annual employment within the city of about 4,500. Ten major seafood processors (out of a total of 57 in the study area) employ between 900 and 1200 persons annually. Seventeen major shipbuilders employ 700 to 1,000 persons, and a major apparel manufacturer employs about 500 persons. The remaining employment is in related and supporting marine and seafood businesses. Bayou La Batre seafood products and new ships are marketed throughout the world. Seafood (mostly shrimp) valued at over $100 million was handled in 1986. Presently, about 150 new vessels, with a sales value of about $90 million (of which about 35 percent are fishing vessels for foreign customers), are built yearly by 17 shipyards; and $4 million in repairs are made to about 1,000 vessels annually. In addition, local interests, with assistance from the U.S. National Marine Fisheries Service, have been experimenting with fishing for butterfish, which is a Japanese delicacy and shows promise as a profitable export item. The shrimp landings at Bayou La Batre, as a percentage of total gulf landings, have remained at a 6 percent market share during the past decade. Additional shrimp are trucked from other ports to the seafood processing plants at Bayou La Batre to give the city a 15 percent market share for processed shrimp.

3. EXISTING IMPROVEMENTS

a. FEDERAL. The existing navigation project, completed in 1967, consists of a 12-foot-deep by 100-foot-wide channel starting at the 12-foot contour line in Mississippi Sound and extends to a turning basin in Bayou La Batre. From the turning basin, a 12-foot-deep by 75-foot-wide channel extends about 3,000 feet upstream to the Highway 188 bridge. The total length of the existing Federal channel is about 6.3 miles. Maintenance dredging is conducted on a 3-year cycle. Of the material dredged during each period, about 25 percent is placed in an upland disposal site and the remainder is placed in open water.

b. NON-FEDERAL. Extensive development and infrastructure to support the commercial fishing and shipbuilding activities exist in close proximity to the bayou. Numerous bulkheads and piers line the channel. From about midway between the mouth of the channel and the turning basin, the bayou is almost solidly bulkheaded on both sides, extending upstream beyond the federally authorized channel on Bayou La Batre and up Snake Bayou, a major tributary. Local property owners have also dredged the natural channels upstream of the Federal project. In many locations, buildings housing seafood processing and marine supply facilities are only a few feet landward of the bulkheads.

4. PROBLEMS AND NEEDS

a. The problems with the existing channel are depth related for the commercial fishing fleet, shipbuilding industry, and other marine-related industries. The shipbuilding industry is experiencing a demand for construction and repair of larger vessels which cannot be accommodated by existing channel depths. Large vessel construction and repair work are currently being performed by foreign and domestic shipbuilders at greater costs than could be obtained through the small-business shipyards with a flexible multi-skill workforce at Bayou La Batre. These larger vessels include fishing boats, oil supply and crew vessels, and U.S. military and U.S. Coast Guard vessels. Also, due to substantial increases in oil and natural gas exploration and production activity in Mobile Bay and the adjacent Gulf of Mexico, it is expected that split operations for the servicing and repair of vessels used in gas and oil operations will increase significantly in the future. These split operations involve initial construction at Bayou La Batre and final outfitting at another port. Diversification of commercial fishing also is occurring, as evidenced by the developing butterfish fishing and processing market, which requires larger vessels for operational efficiency.

b. Shoreline erosion is a problem along Mississippi Sound. The barrier islands, due to their exposure, experience a much greater erosion rate than the mainland. The loss of marsh areas, due to subsidence and erosion, is evident within the study area. An opportunity exists to protect and enhance marsh areas with specifically designed dredged material disposal plans.

5. IMPROVEMENTS DESIRED. Local interests desire modernization of the Federal project at Bayou La Batre to avoid tidal delays, to reduce vessel damages when operating during low-water conditions, to allow building and repair of deeper draft vessels, and to permit operation of deeper draft fishing vessels.

6. ALTERNATIVES CONSIDERED. Alternative project depths ranging from 14 feet to 22 feet were evaluated. Alternative alignments and spoil disposal areas were combined to provide a total array of nearly 100 alternative plans. Nine different dredged material disposal alternatives were considered in formulating the recommended plan. Improvement plans for Snake Bayou and the upper Bayou La Batre were formulated incrementally and added to the plan selected for the lower bayou and Mississippi Sound.

7. PROPOSED PLAN OF IMPROVEMENT. The district engineer's selected plan provides for modification of the existing projects for Bayou La Batre as follows:

a. WITHIN BAYOU LA BATRE

(1) Deepening the existing 12-foot-deep by 100-foot-wide channel and turning basin to 18 feet (1.89 miles).

(2) Deepening the existing 12-foot-deep by 75-foot-wide channel to 14 feet (0.57 mile).

(3) Extending a new 14-foot-deep by 75-foot-wide channel (.29 mile) above the Highway 188 bridge.

(4) Extending a new 14-foot-deep by 50-foot-wide channel (.26 mile) up Snake Bayou, a tributary of Bayou La Batre.

b. WITHIN MISSISSIPPI SOUND. Deepening and widening the existing 12-foot-deep by 100-foot-wide channel to 18 feet deep by 120 feet wide and extending along the same alignment to the Gulf Intracoastal Waterway (GIWW), about 7.69 miles, and thence extending west along the intracoastal waterway to the existing Pascagoula Ship Channel, about 12.39 miles.

c. Dredged material from Bayou La Batre and Snake Bayou, totaling about 567,300 cubic yards, would be placed in upland disposal sites. About 2,040,000 cubic yards of material would be dredged from Mississippi Sound of which about 1,300,000 cubic yards would be used to construct a berm to protect wetlands at Isle aux Herbes. The remainder would be placed in open water greater than 12 feet deep using thin-layer techniques. About 486,000 cubic yards from the GIWW portion of the construction would be placed in open water using thin-layer deposition. Maintenance dredging would be disposed of in either existing disposal areas or by using thin-layer techniques.

8. In accordance with established policies, the replacement of bulkheads and piers necessary to safely accommodate the increased channel depths are a non-Federal responsibility. Based on analysis of subsurface boring logs and samples, most dredging can be accomplished with hydraulic pipeline dredge with possible use of mechanical dredge and hopper barges in scattered shoal areas. Channel sideslopes would vary from 1 on 3 within the bayou to 1 on 5 within the sound. Utility relocations would be required for two force mains, one 6-inch cast iron and one 6-inch PVC, which cross the channel upstream and downstream from the turning basin, respectively.

9. ECONOMIC EVALUATION. Based on October 1988 price levels, the district engineer estimates the first cost of the plan to be $15,072,000 of which $11,221,000 would be non-Federal, including $8,317,000 for bulkhead and pier replacements, and $370,400 for utility relocations. Average annual costs, based on an interest rate of 8 5/8 percent and a 50-year period for economic analysis, are $2,188,900 including $215,100 for increased annual operation and maintenance. Average annual benefits are estimated at $5,948,400, and the benefit-cost ratio is 2.7.

10. PROJECT EFFECTS. The recommended plan will eliminate present delays to fishing vessels awaiting favorable tides and reduce the number of groundings for vessels navigating during low-water conditions. The recommended 18-foot project depth will provide operational savings for shipbuilding and repair businesses. With the increased depth, shipbuilders also will be able to help meet increasing needs for larger ships, and jobs within the industry will be more secure. Anticipated larger specialized fishing vessels will also be able to operate fully loaded with an 18-foot project depth.

11. ENVIRONMENTAL IMPACTS. There are no major adverse environmental impacts resulting from project implementation. Construction of a berm at Isle aux Herbes with material dredged for the project will help reduce present shoreline and wetland erosion. This wetland protection will more than offset the temporary aquatic habitat losses caused by project construction.

12. RECOMMENDATION OF THE REPORTING OFFICERS. The district engineer recommends that the existing navigation project for Bayou La Batre, Alabama, be improved in accordance with the plan

described in his report, subject to certain items of local cooperation. The division engineer concurs.

REVIEW BY THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS

13. GENERAL. The board's review encompassed the overall technical, economic, social, institutional, environmental, and policy aspects involved in the formulation of alternative plans of improvement and in the findings, conclusions, and recommendations of the reporting officers. The board considered the results of the consolidated Washington level review and the conformance of the recommended plan with essential elements of the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. The board also considered the views of interested parties including Federal, State, and local agencies. Particular attention was given to:

a. The non-Federal sponsorship and sharing of project costs by the State of Alabama in conjunction with the County of Mobile and the City of Bayou La Batre, and the certainty of their collective financial ability to meet all non-Federal costs.

b. The revised project benefit analysis for shipbuilding and repair operations and for butterfish fishing and marketing.

14. RESPONSES TO THE DIVISION ENGINEER'S PUBLIC NOTICE. The division engineer issued a public notice on 30 September 1988 stating the findings and recommendations of the reporting officers and inviting public comment to the board. No communications were received in response to the division engineer's notice.

15. FINDINGS AND CONCLUSIONS. The Board of Engineers for Rivers and Harbors concurs in the findings and recommendations of the reporting officers and in the technical review findings of the Washington Level Review Center resulting from the Washington level review process. The board finds that the recommended improvements to the existing navigation project for Bayou La Batre, Alabama, identified as the NED plan, are economically justified, technically sound, and environmentally and socially acceptable. Greater project depths will benefit seafood harvesting and processing by eliminating delays to fishing vessels awaiting favorable tides, reducing groundings for vessels risking shallow water conditions, and allowing use of larger, more efficient fishing vessels. Greater project depths also will provide operational savings for shipbuilding and repair and allow construction and servicing of deeper-draft vessels. Both

shipbuilding and seafood products are major export businesses and are a benefit toward U.S. foreign trade balance.

16. The board notes that part of both the shipbuilding and the butterfish benefits relate to use of larger, deeper draft vessels that require an 18-foot project depth to operate efficiently. The analysis conducted by the district engineer was conservative, and a much greater number of large vessels are likely to make use of the improvement than considered for benefit evaluation purposes. However, by their specific nature these benefits are somewhat speculative; therefore, a sensitivity analysis was made. The analysis shows that the recommended plan is still economically justified without the use of the larger vessels although the designated NED plan would change to a lesser depth.

17. The board also notes that aggressive small business entrepreneurship has been the hallmark of success in shipbuilding, seafood, and related industries in Bayou La Batre. Of particular note is that in 1986 about 35 percent of the shipbuilding and 40 percent of repairs were for foreign fleets. This represents a significant success over worldwide competition for small commercial vessel construction and repair. Based on this entrepreneurship record, the board believes that the shipyards in Bayou La Batre will aggressively pursue contracts for construction and repair of larger vessels if a deeper channel is provided. In fact, the district engineer has presented evidence to the board showing that local shipbuilders had to decline repair contracts or were eliminated from bidding due to the inadequacy of present channel depths.

18. Based on October 1988 price levels, the district engineer estimates the first cost of the proposed project to be $15,072,000, of which $3,851,000 would be Federal. Total average annual charges, based on an interest rate of 8 7/8 percent and a 50-year period for economic analysis, are $2,247,300. Annual charges include operations and maintenance of $215,100. Average annual benefits are $5,988,700. The benefit-cost ratio for the recommended plan is 2.7 to 1. The recommended plan is the plan that reasonably maximizes net NED benefits.

19. The proposed plan would have a maximum channel depth of 18 feet MLW. Therefore, in accordance with the requirements of Public Law 99-662, as amended, non-Federal interests would be responsible for:

a. Providing during the period of construction a cash contribution equal to 10 percent of the total cost of construction of the general navigation facilities;

b. Paying with interest over a period not to exceed 30 years following completion of the project, or separable element thereof, an additional 10 percent of the total cost of construction of general navigation facilities, the interest rate to be determined pursuant to section 106 of Public Law 99-662. The value of lands, easements, rights-of-way, relocations, and borrow and dredged material disposal areas would be credited toward this required payment;

c. Performing or assuring performance of all necessary alterations and relocations of pipelines, cables, sewer outlets, and other utilities;

d. Providing to the Government all lands, easements, and rights-of-way, including suitable borrow and dredged material disposal areas, and performing all relocations or alterations of bulkheads, piers, and related facilities other than utilities governed by paragraph c. above (except relocations or alterations of highway and railroad bridges) determined by the Government to be necessary for construction, operation, or maintenance of the project; and

e. Holding and saving the Government free from all damages arising from the construction, operation, and maintenance of the project, except for damages due to the fault or negligence of the Government or its contractors.

20. RECOMMENDATIONS. The board recommends that the existing project for Bayou La Batre, Alabama, be modified to provide for navigation improvements generally in accordance with the reporting officers' recommended plan, with such modifications as in the discretion of the Chief of Engineers may be advisable. These recommendations are subject to cost sharing, financing, and other applicable requirements of Public Law 99-662, as amended and otherwise provided by law, and that the non-Federal sponsor agrees to comply with the following requirements:

a. Provide and maintain adequate public docks, terminals, and transfer facilities open to the use of all on equal terms, and provide and maintain depths in berthing area and local access channels serving the terminals commensurate with project depths;

b. Prohibit erection of any structure that would encroach on the authorized project channel, at such distance to be determined by the district engineer.

21. The recommendations contained herein reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect program and budgeting priorities inherent in the local and State programs or the formulation of a national civil works construction program. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

FOR THE BOARD:

GEORGE K. WITHERS, JR.
Major General, USA
Chairman

REPORT OF THE DISTRICT ENGINEER

BAYOU LA BATRE, ALABAMA

FEASIBILITY REPORT
ON
IMPROVEMENT OF THE EXISTING
FEDERAL NAVIGATION CHANNEL

SYLLABUS

The Feasibility Report on Navigation Improvements at Bayou La Batre, Alabama was completed in September 1988. The report was subjected to a Army Corps of Engineers Washington level detailed review prior to action taken by the Board of Engineers for Rivers and Harbors. This process consists of concurrent review by the Office of the Assistant Secretary of the Army for Civil Works, Office of the Chief of Engineers, Washington Level Review Center, and the staff for the Board of Engineers for Rivers and Harbors.

As a result of comments received during the detailed review of the project, it became necessary to revise the National Economic Development benefits of the project. Appendix F was developed to addressed the issues and concerns raised during the final review of the Bayou La Batre Feasibility Report.

Appendix F to the Bayou La Batre Feasibility Report contains revisions to Appendix B, Economic Analysis. The major areas of revision include the economic analyses for butterfishing, shipbuilding split operations, and shrimping.

BAYOU LA BATRE
FEASIBILITY REPORT
BAYOU LA BATRE, ALABAMA

I. INTRODUCTION.

The City of Bayou La Batre, Alabama and the bayou after which it is ~~named are located in~~ southern Mobile County, Alabama. The community has a long history and tradition in the fishing and boat building trades and has developed into one of the most active ports for these activities within the United States. Bayou La Batre is served by an existing Federal channel; however, due to increases in the level of activity and sizes of commercial fishing and other vessels utilizing and/or being constructed within the existing project, the need to investigate the feasibility for potential improvements exists.

A. Study Objective. The objective of the Bayou La Batre Feasibility Study was to investigate the potential for deepening, widening and extending the existing Federal channel and to identify the plan which maximized net economic benefits while conforming to all environmental laws and regulations.

B. Authority. This feasibility study was conducted under the authority of a United States House of Representatives Public Works Committee resolution adopted 10 October 1974.

> *"The Board of Engineers for Rivers and Harbors is requested to review the report on Bayou La Batre (House Document 327, 88th Congress, 2nd Session) and other pertinent reports with a view to determining the advisability of modifying the existing project in any way at this time."*

C. Scope of Study. The scope of study for the Bayou La Batre Feasibility Study included the major analyses necessary to investigate the feasibility for deepening, widening and extending the existing Federal channel. Potential project depths investigated ranged from 14 feet to 22 feet. The geographic area of study included the existing bayou and channel as well as the adjacent Mississippi Sound and Gulf of Mexico.

D. Background.

1. History of the Area. This small predominantly Catholic town is replete with generations of seafaring families who guardedly pass their boat building and fishing knowledge and folklore down to the next generation. Located off Mississippi Sound in the extreme southwestern corner of Mobile County, Bayou La Batre is well isolated from other population centers in coastal Alabama.

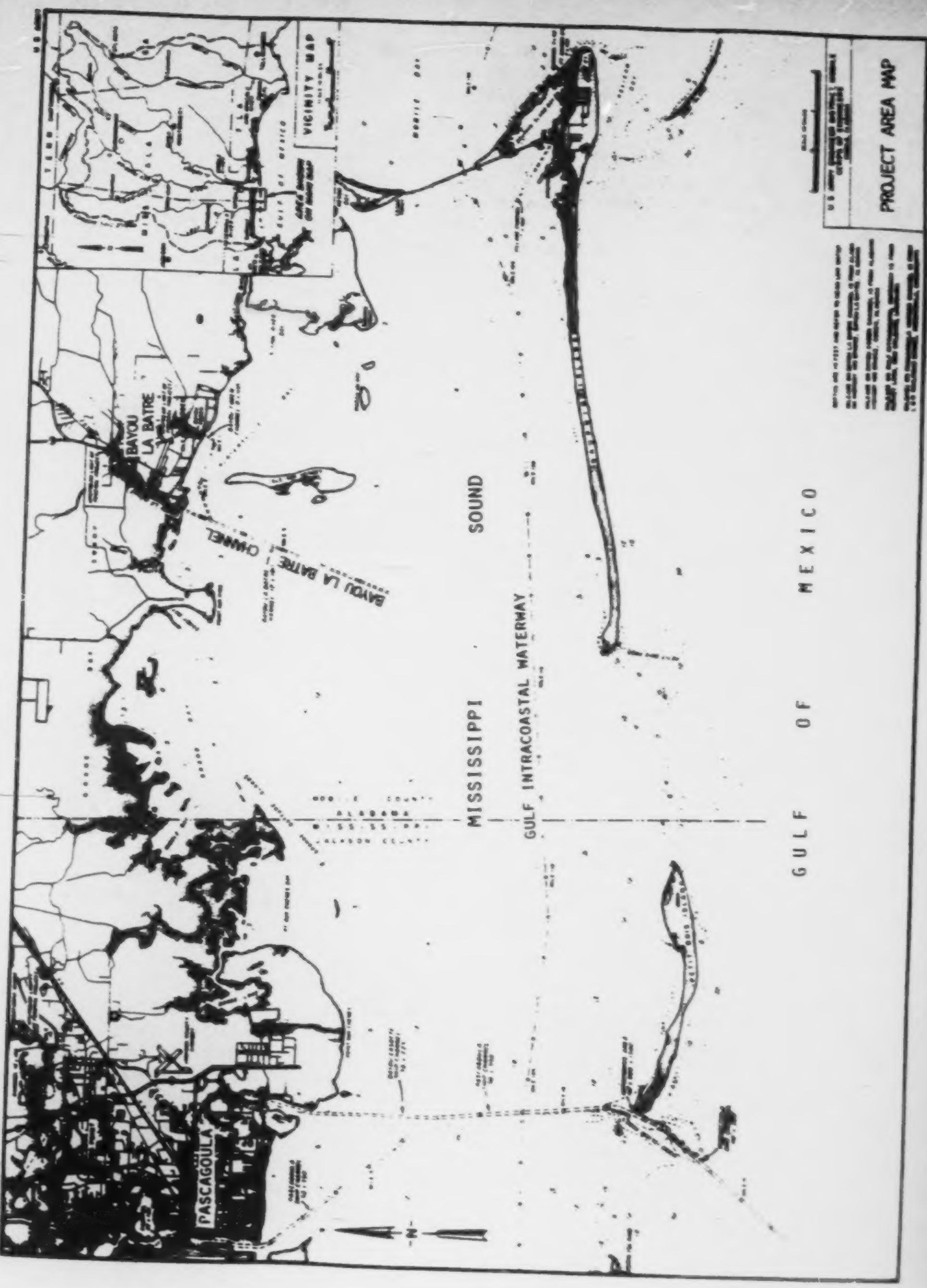
PASCAGOULA
BAYOU LA BATRE
BAYOU LA BATRE CHANNEL
MISSISSIPPI SOUND
GULF INTRACOASTAL WATERWAY
GULF OF MEXICO
ALABAMA
MISSISSIPPI
VICINITY MAP
PROJECT AREA MAP
N

FIGURE 1

Historical records indicate that Bayou La Batre was first settled in the year 1713 by Jean Baptiste and Sieur de Bienville, former governor of French Louisiana. When the latter retired from the governorship of Louisiana, he settled in Bayou La Batre and built the battery of artillery for which the bayou is named. This battery of artillery was constructed for the purpose of defending their smuggling and pirating interests.

In 1786, Joseph Baussage petitioned the Spanish Governor of the Louisiana Holding for "...a piece of land situated on Bayou Batre...in order that (he and his wife and children) may live thereon undisturbed, and conceal from the eyes of the world (his)...poverty and misery..."[1]. The petition was granted and Monsieur Baussage and his family established residency to fish and plant corn.

When coastal Alabama was opened to British and American settlers; fishing, livestock and, later, resort hotels became the important economic pursuits. At the turn of the century, however, fishing and seafood processing were predominant. Shipbuilding emerged at Bayou La Batre during World War I and has gained in importance since that time[2].

2. Demographics. From the time of incorporation in 1955, Bayou La Batre has maintained a relatively stable population except for the late 1970's and early 1980's. During these years population out-migration occurred because of a slump in the oil exploration industry. As shown in Table I, the population of Bayou La Batre decreased from a 1970 total of 2,664 persons to 2,005 persons in 1980. Population data for 1984 indicate an increase to 2,162 persons[3].

With a land area of 3.7 square miles, the population density averages approximately one inhabitant per acre. The distribution of the population, however, is primarily clustered along the bayou which reflects its importance in their lives.

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[1] Hamilton, P. J., 1910, 1976.

[2] South Alabama Regional Planning Commission, 1977.

[3] Office of State Planning and Federal Programs, State of Alabama, 1985.

TABLE I
POPULATION AND POPULATION CHARACTERISTICS
BAYOU LA BATRE, ALABAMA

ITEM	BAYOU LA BATRE
Population	
1984	2,162
1980	2,005
1970	2,664
1960	2,572
Percent Black	9.6%
Percent Spanish Origin	1.6%
Percent Male	46.5%
Median Age	29.1
Total Number of Families	517
Percent Married Couples	78.9%
Percent Female Householder	16.6%

A private consultant for Bayou La Batre, Galbraith & Associates, estimates total annual employment of 4500 persons within the city. The majority of the employment is centered around the commercial fishing, shipbuilding and other marine related industries. The major employers within the city include the ten major seafood processors which employ a total of from 900 to 1,200 persons annually and seventeen major shipbuilders that employ 700 to 1,000 persons[4]. A major apparel manufacturer employs an additional 500 persons annually[5]

The remaining employment in other marine related industries at Bayou La Batre include outrigging; net making; trawl board manufacturing; diesel fuel and supply sales; self-employed crews of commercial fishing vessels; and employment in approximately 26 small retail seafood houses. The potential for double counting employment in Bayou La Batre is high since, for example, a shipyard worker may also crew a shrimp trawler during the two major shrimping seasons and may oyster and crab during these seasons as well.

3. Economic Profile.

a. Commercial Fishing. Bayou La Batre has a long history in the commercial fishing industry. Seafood harvesting and processing have traditionally been the primary source of employment and income for the area. Due to the efficiency of the seafood operations at the port, Bayou La Batre products are marketed throughout the world. According to the Alabama Sea

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[4] Alabama Development Office, 1988.

[5] Ibid.

Grant Advisory Service, a total of 57 seafood processors operate in Bayou La Batre and represent the largest dollar volume and employment industry in the study area.

In 1986, Bayou La Batre was ranked 29th among United States ports in quantity of commercial fishery landings - 25.6 million pounds - and 7th nationally in value of landings - $43.3 million - due to the value of shrimp[6]. Table II contains data on shrimp and other fisheries landings at Bayou La Batre from 1980 through 1986.

TABLE II

SHRIMP AND TOTAL FISHERY LANDINGS, BAYOU LA BATRE 1980 - 1986

Shrimp, Heads On[7]	1980	1981	1982	1983	1984	1985	1986
Landings (millions)	9.9	13.0	10.0	10.0	12.0	13.0	14.5
Value ($ millions)	21.0	25.0	27.0	26.0	28.0	24.0	36.0
Average $/lb.	2.12	1.92	2.70	2.60	2.33	1.85	2.53
Other Fisheries							
Landings (millions)	10.0	12.1	7.8	3.6	6.2	8.1	11.6
Value ($ millions)	2.7	6.4	6.8	2.5	3.5	6.4	6.6
Average $/lb.	0.27	0.53	0.87	0.69	0.56	0.79	0.57
Total Fisheries[8]							
Landings (millions)	19.9	25.1	17.8	13.6	18.2	21.1	25.6
Value ($ millions)	23.7	31.4	33.8	28.5	31.5	30.4	43.3
Average $/lb.	1.19	1.25	1.90	2.10	1.73	1.44	1.69

In addition, over 28 million pounds of shrimp were transported by truck to Bayou La Batre in 1986 for processing and wholesale distribution, bringing the total value of seafood handled at Bayou La Batre to over $100 million. Of the Gulf of Mexico ports, only two (Brownsville - Port Isabelle, Texas and Aransas Pass - Rockport, Texas) exceeded the total value of shrimp landings at Bayou La Batre.

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[6] *Fisheries of the United States*, 1986.

[7] National Marine Fisheries Service Office, Bayou La Batre, Alabama.

[8] *Fisheries of the United States*, 1986. *Op. cit.*

An additional experimental commercial fishing venture shows promise for future development in Bayou La Batre. Butterfish, formerly of no commercial value in the United States, is a Japanese delicacy bringing high prices in that country and are abundant in the Gulf of Mexico. The potential annual value of butterfish to be landed and processed in Bayou La Batre is $48 million. More information concerning this potential commercial fishery is contained in Appendix B, Economic Analysis, to this report.

b. Shipbuilding. A total of 17 shipbuilding and boat repair industries are situated along or near the Bayou La Batre. These industries provide annual employment for between 700 and 1,000 persons*. In terms of total employment, shipbuilding and repair is second only to seafood processing in Bayou La Batre.

These shipyards constructed approximately 1100 vessels for domestic use from 1975 through 1986 and approximately 250 vessels for foreign interests during the same period. Presently, about 150 vessels are constructed each year in Bayou La Batre bringing a total sales value of $90 million annually. Repairs to over 1000 vessels are performed each year at a value of $4 million.

4. Existing Federal Project. The existing Federal navigation project at Bayou La Batre, completed in March 1967, consists of a 12' x 100' channel extending from the 12-foot depth contour in Mississippi Sound to a turning basin within the bayou located about 3,000 feet below the Highway 188 bridge. See Figure 2. From the turning basin, a 12' x 75' channel extends upstream to the Highway 188 bridge. The total length of the existing Federal channel is about 6.3 miles.

E. Study Background. The Bayou La Batre Feasibility Study was begun in Fiscal Year 1986 and is the first cost shared feasibility study to be conducted within the South Atlantic Division. The local sponsor is the City of Bayou La Batre, Alabama which is sharing equally in the cost of the study with the Mobile District. The cost sharing agreement, along with the escrow account agreement, was signed on May 21, 1986.

The Mobile District was responsible for the conduct and coordination of the study, the formulation of plans, and the preparation of this feasibility report. The study was conducted utilizing a multidisciplinary study team approach and was

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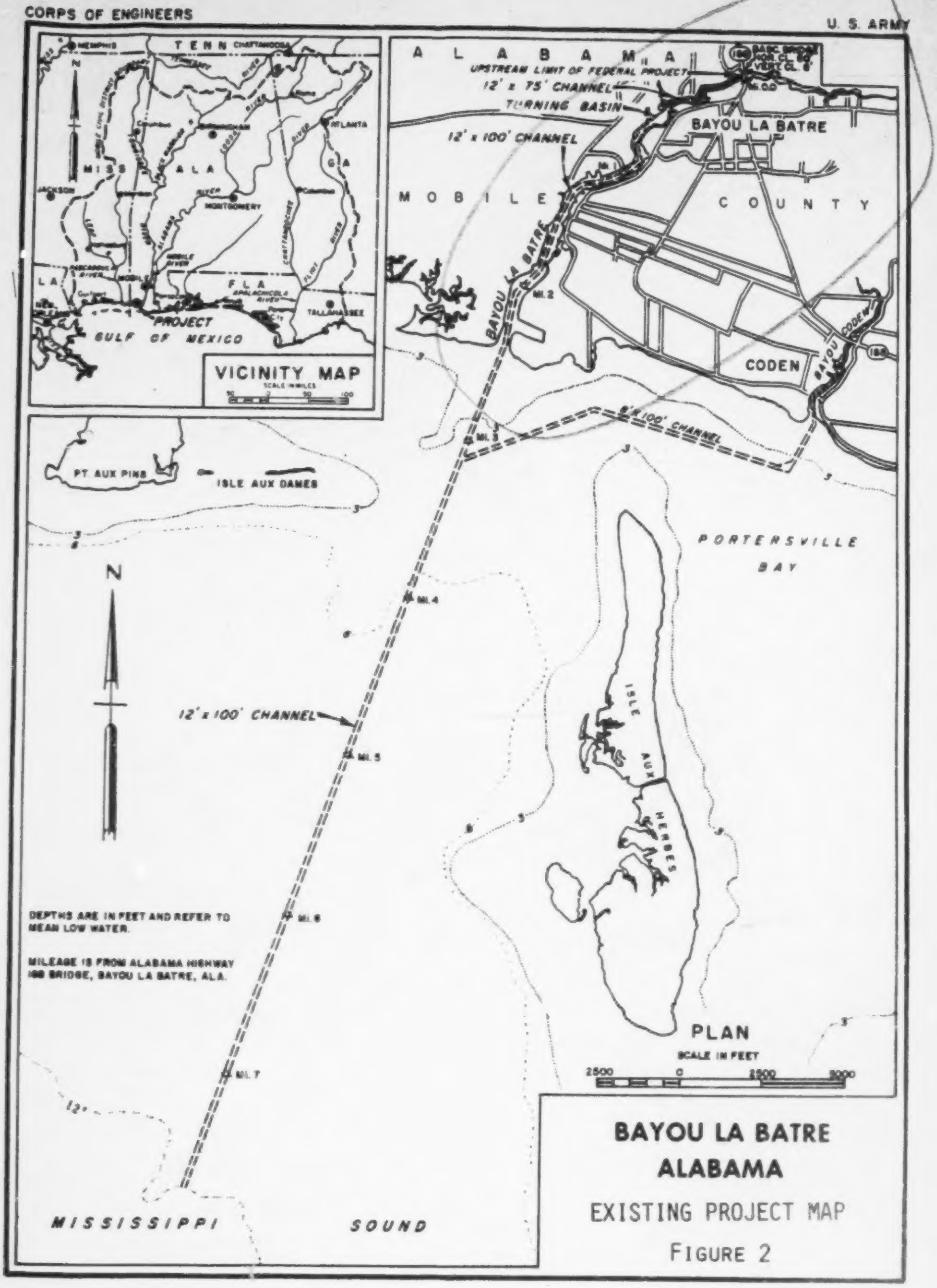
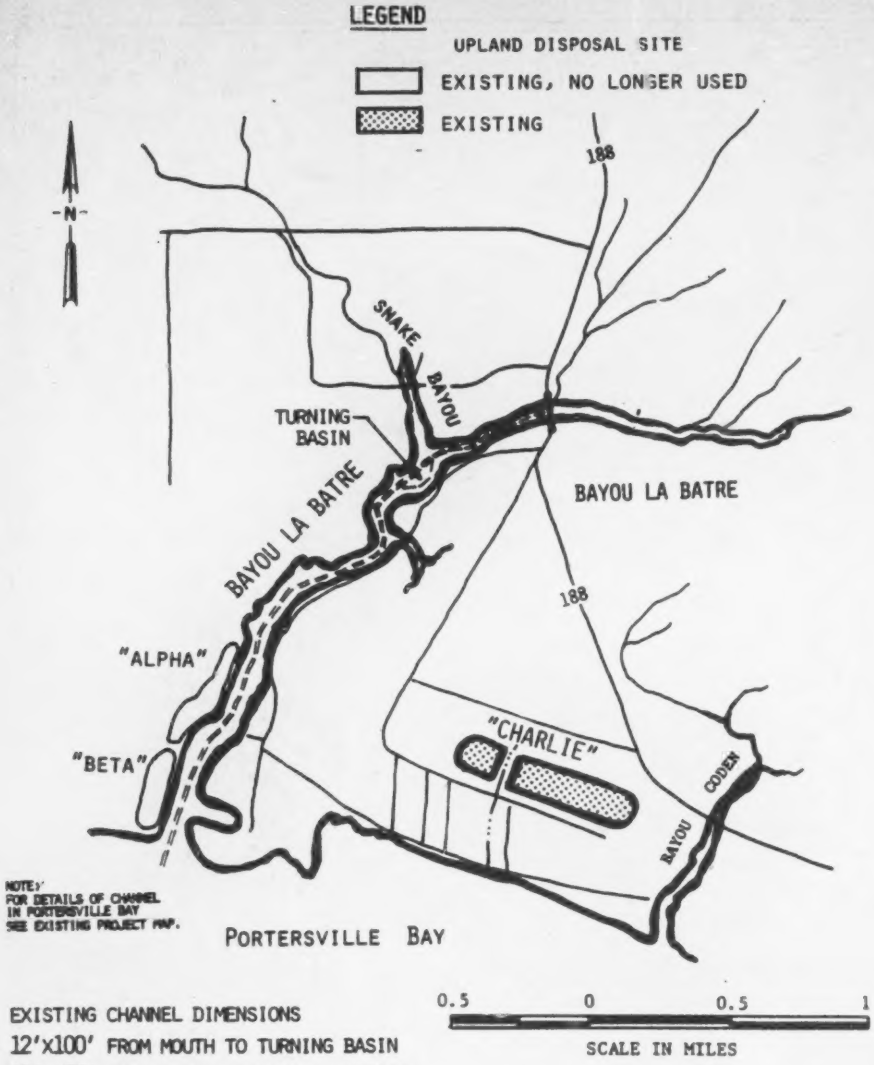
*Alabama Development Office, 1988, Op. cit.


CORPS OF ENGINEERS
U. S. ARMY
TENN
MEMPHIS
CHATTANOOGA
MISS
ALA
GA
ATLANTA
JACKSON
MONTGOMERY
BIRMINGHAM
MOBILE
FLA
TALLAHASSEE
LA
PROJECT
GULF OF MEXICO
VICINITY MAP
SCALE IN MILES
ALABAMA
UPSTREAM LIMIT OF FEDERAL PROJECT
12' x 75' CHANNEL
TURNING BASIN
12' x 100' CHANNEL
BAYOU LA BATRE
MOBILE COUNTY
BAYOU LA BATRE
MI. 0.0
MI. 1
MI. 2
MI. 3
MI. 4
MI. 5
MI. 6
MI. 7
188
CODEN
BAYOU CODEN
6' x 100' CHANNEL
PT. AUX PINS
ISLE AUX DAMES
PORTERSVILLE BAY
N
12' x 100' CHANNEL
ISLE AUX HERBES
DEPTHS ARE IN FEET AND REFER TO MEAN LOW WATER.
MILEAGE IS FROM ALABAMA HIGHWAY 188 BRIDGE, BAYOU LA BATRE, ALA.
PLAN
SCALE IN FEET
2500
0
2500
5000
MISSISSIPPI SOUND
3
6
12

BAYOU LA BATRE
ALABAMA

EXISTING PROJECT MAP

FIGURE 2


LEGEND
UPLAND DISPOSAL SITE
EXISTING, NO LONGER USED
EXISTING
N
188
SNAKE BAYOU
TURNING BASIN
BAYOU LA BATRE
BAYOU LA BATRE
188
"ALPHA"
"BETA"
"CHARLIE"
CODEN BAYOU
NOTE:
FOR DETAILS OF CHANNEL IN PORTERSVILLE BAY SEE EXISTING PROJECT MAP.
PORTERSVILLE BAY
0.5
0
0.5
1
SCALE IN MILES

EXISTING CHANNEL DIMENSIONS
12'x100' FROM MOUTH TO TURNING BASIN
12'x 75' FROM TURNING BASIN TO BRIDGE

BAYOU LA BATRE, ALABAMA
EXISTING PROJECT
FIGURE 3

coordinated with all appropriate Federal, state and local agencies. The Federal agencies included the U.S. Fish and Wildlife Service, National Marine Fisheries Service, Environmental Protection Agency, and National Park Service. State agencies included the Alabama Department of Environmental Management, Alabama Department of Conservation and Natural Resources, Alabama State Historic Preservation Officer, Mississippi Bureau of Marine Resources, Mississippi Bureau of Pollution Control, and the Mississippi Historic Preservation Officer. Other interests included the 20-foot Plus Committee which is composed of various channel users at Bayou La Batre.

Typical Commercial Fishing Vessel, Bayou La Batre.

II. EXISTING CONDITIONS.

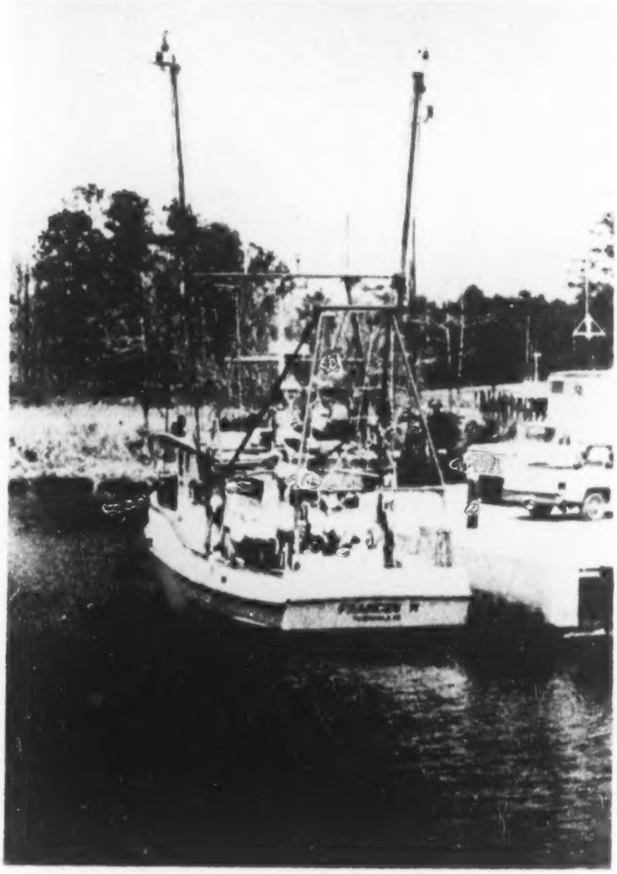
A. General. This section of the feasibility report addresses the existing conditions of the Bayou La Batre study area. The descriptions of the existing conditions include the development and infrastructure along the bayou; physical and environmental conditions; commercial fishing and shipbuilding activities; existing channel operations and problems concerning the existing Federal project.

B. Existing Development and Infrastructure. Extensive development and infrastructure to support the commercial fishing and shipbuilding activities exist in close proximity to the bayou. Numerous bulkheads and piers line the channel. Starting at about midway between the mouth of the bayou and the turning basin, Bayou La Batre is almost solidly bulkheaded on both sides. The extensive bulkheading continues above the Highway 188 bridge and into Snake Bayou, a major tributary of Bayou La Batre. In many locations, buildings owned by seafood processors and marine supply dealers exist only a few feet back from the bulkheads. The bulkheads along the bayou are used for docking, unloading catch and for loading supplies onto vessels.

C. Physical Resources and Conditions.

1. Physiography. The study area is classified as coastal lowlands, ranging from sea level to about 30 feet in elevation and from 0 to 10 miles in width. These flat to gently undulating, locally swampy lowlands are underlain by alluvial, deltaic, estuarine, and coastal deposits which merge with the fluvial-deltaic plains of the streams in the area. Many tidally influenced creeks, rivers and estuaries indent the coastline.

Bayou La Batré and Mississippi Sound are underlain by consolidated and unconsolidated sediments that range in age from Holocene to Miocene. The oldest - Miocene - sediments that outcrop in the coastal area consist of consolidated light gray to variegated and mottled consolidated clays interbedded with sand and gravel zones. The sand and gravel strata contain water under artesian pressure and are a major aquifer in the coastal area. The Miocene section ranges from several hundred to possibly several thousand feet thick. The Pliocene age Citronelle Formation unconformably overlies the Miocene deposits. The Citronelle Formation consists predominantly of reddish brown to orange and yellow gravelly sand. Interspersed in the gravelly sand are lenses and partings of gray, orange, and brown sandy clay. The thickness of the Citronelle Formation varies from a few tens of feet in northern Mobile County to as much as 200 feet in the vicinity of Dauphin Island. Semi-consolidated to unconsolidated sediments (sand, silty sand, clay sand, and clay) of Pleistocene and Holocene age overlay the Citronelle Formation in Mississippi Sound. These sediments are several tens of feet thick and constitute the majority of the material which would be encountered in the improvement of the Bayou La Batre channel.



Concrete Bulkhead and Loading Dock, Bayou La Batre.

Petit Bois and Dauphin Islands consist of a broad, developed beach backed by dunes on the south shore. Beach and intermittent marsh backed by dunes occurs on the north shore of the islands. The interior of these barrier islands is either broad, low sand flats one to two feet above sea level with marshes and shallow lakes; or, vegetated ridges 5 to 40 feet above sea level. The western end of Dauphin Island is narrow with only small vegetated dunes. This area is the result of rapidly occurring accretion, averaging 157 feet per year (2.5 miles added between 1917 and 1983)[10]. The eastern end of Petit Bois Island has experienced significant erosion with the island being reduced in length by approximately 50% between 1851 and 1966. This erosion/deposition cycle indicates considerable occurrence of longshore drift in a westwardly direction.

Surficial mapping of sediments indicates that the shelf source of sand is east of Mobile Bay, where the sand is continuous from the mainland to the shoal bottom[11]. The sands leave Mobile Point and enter the shoals of the submarine ebb-tidal delta south of the entrance into Mobile Bay. The sands are transported across the shallow northwest banks along the south shore of Dauphin Island. West of Dauphin Island, sands drift over a similar, but smaller ebb-tidal delta in Petit Bois Pass and continue westward.

The barrier island facies consist of well-sorted, medium grained, mature quartzose sand containing less than three percent feldspar and having a mineral suite rich in staurolite and kyanite[12]. The average width of the facies is 2.5 miles with an average thickness of 40 feet.

Immediately south of the barrier islands is a nearshore fine-grained facies similar in lithology to that of Mississippi Sound. Movement of sediment from these estuaries forms a fine-grained facies which overlaps the Mississippi-Alabama sand facies in a zone about seven miles wide south of the islands. Beach foreshore sand medians range between 0.33 to 0.56 millimeters (mm) on the north shores (lower energy, coarser sand) and between 0.21 to 0.40 mm on the south shores where energy is less and sands are finer. The textural inversion probably is due to the lesser amounts of fine sand available on the north beaches where the fine sand fraction is constantly moving. Because of the good sorting values, wave energies and sand supply appear to be in balance on both north and south shore beaches[13].

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[10] Alabama Department of Economic and Community Affairs, n.d.

[11] Shabica, 1978.

[12] Hsu, 1960 in Boone, 1973.

[13] Otvos, 1982.

The Mississippi-Alabama shelf is a triangular area on the seaward side of the barrier islands that extends from the Mississippi River delta on the west to the Desoto Canyon south of Panama City, Florida, on the east. The shelf is about 80 miles wide in the west and narrows to about 35 miles in the east. The shelf is an extensive, almost flat plain bounded on the landward side by the relatively steep but narrow shoreface of the Mississippi Sound. The break in slope between shoreface and shelf occurs at a depth of about 20 feet along the barrier island system. A clayey silt/clay/clayey sand area exists south of Petit Bois Island possibly due to the fine-grained sediment from the East Pascagoula River entering the gulf via the existing 38-foot deep navigation channel, and flocculating/settling due to the higher salinity gulf waters. This area appears to have a lower velocity regime compared to contiguous areas.

2. Soils. Soils within Bayou La Batre consist of inorganic clays of high plasticity, poorly-graded sands, sand-silt mixtures, and sandy-clay mixtures. The upper two to five feet of material consists of very soft, black to dark gray clay. This material has the consistency of grease, a very high percentage of water by weight, and contains organic material in concentrations of 8% to 24% by weight. Most of the material below -18 feet Mean Low Water (MLW) within the bayou consists of higher quality soils including sands and sand-silt-clay mixtures.

Soils within Mississippi Sound consist of inorganic clays of high plasticity, poorly graded sands, sand-clay mixtures, and inorganic clays of low to medium plasticity. Sands and sandy mixtures decrease greatly in significance from the mouth of the bayou southward for a distance of approximately 28,000 feet. Clays increase in significance along this reach and become dominant between 28,000 and 53,500 feet. Sandy material begins to show up in the soil profile in the area south of the Gulf Intracoastal Waterway and becomes dominant through the tidal pass into the Gulf of Mexico. Firm to stiff clays are encountered throughout the channel at depths of -18 feet MLW in the northern portion of the sound to -22 feet MLW in the vicinity of the Gulf Intracoastal Waterway. See Figure 4 and Appendix E, Engineering Data and Cost Estimates.

3. Sediment Chemistry. Although sediments may contain unusually high concentrations of metals and other constituents, this does not mean that these, if disturbed, will be released into the water column or result in toxicity to aquatic organisms. Many factors control the mobilization of these constituents: salinity, particle size, clay mineralogy, pH, Eh, organic content, partitioning of the constituent within the sediment, etc. Thus, mobilization of the constituents into the water column is a very complex mechanism. At present, no Federal or state criteria exist specifying allowable concentrations of constituents in sediments.

Analyses of sediments from a number of locations in the Bayou

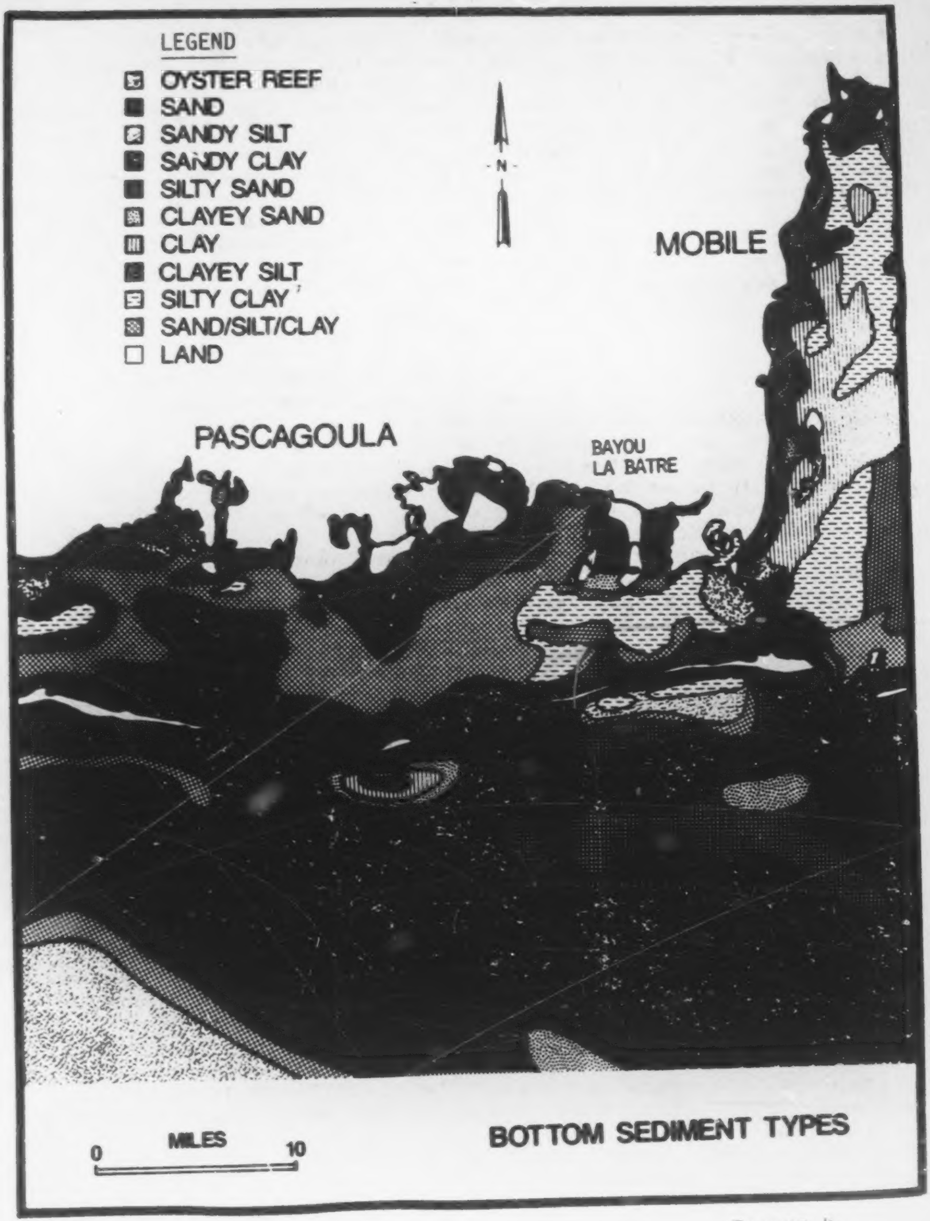
LEGEND
OYSTER REEF
SAND
SANDY SILT
SANDY CLAY
SILTY SAND
CLAYEY SAND
CLAY
CLAYEY SILT
SILTY CLAY
SAND/SILT/CLAY
LAND
N
MOBILE
PASCAGOULA
BAYOU LA BATRE
0
MILES
10
BOTTOM SEDIMENT TYPES

FIGURE 4

La Batre study area have been performed in the past (Figures 5 & 6; Gulf South Research Institute (GSRI), 1977; Vittor, 1981; and Lytle and Lytle, 1982). These studies suggest highly variable concentrations of nutrients, heavy metals, high molecular weight hydrocarbons, and pesticides. Mercury, arsenic, copper, zinc, cadmium, and lead were found to occur in concentrations greater than average crustal abundance in the 1977 studies[14]. In addition, chlordane, DDT (TDE), DDT, dieldrin, PCBs (AR 1254 and AR 1260) were detected during these studies. Elutriates performed on one sample indicated that with the exception of nickel and iron, these compounds were tightly bound to the sediments and would not be released to the water column with disturbance, such as from dredging.

Lytle and Lytle (1982) sampled one location from the vicinity of Bayou La Batre in an area of an active openwater disposal site. The results of their analyses indicated that petroleum hydrocarbon residues were predominant within the top 200 cm of sediment reaching levels of 12 ppm. Below 200 cm depth into the sediments, low levels of natural hydrocarbons were present. Phenol concentrations were typically less than 1 ppm and were variable with depth. They also sampled a site just north of the Gulf Intracoastal Waterway north of Dauphin Island. At this site petroleum hydrocarbons, concentrations of up to 50 ppm, were encountered within the top 100 cm of sediment. Other sites within the general area showed low levels of petroleum hydrocarbons in surficial sediments with natural terrestrial hydrocarbons being predominant.

Sediment tests performed by the Environmental Protection Agency (1988) as part of this feasibility study included toxicity and bioaccumulation tests from three locations in the channel (Figure 6). Results indicated that the toxicity of each of these three sediment samples was minimal. Exposure to the sediments for 10 days had little observable adverse effect on oysters (Crassostrea virginica) or pink shrimp (Penaeus duorarum). Survival of polychaetes (Nereis virens) was less than desirable;, however, there was not a location-specific effect with survival being 62% in the reference sediment; 44% in Site 1; 66% in Site 2; and 50% in Site 3 sediment. Survival in 100% suspended particulate phase of mysids (Mysiodopsis bahia) was greater than 80%. Residues of selected chlorinated hydrocarbon pesticides, PCBs, or chlorplyrifos (Dursban) were not detected in sediments or animal tissues before or after exposure. However, several heavy metals were detected in sediments and tissues. Concentrations of metals in oysters and lugworms (Arenicola cristata) exposed to sediment from sites 1, 2, or 3 were not significantly greater than concentrations of metals in animals exposed to reference sediment. In shrimp, concentrations of zinc were significantly higher in animals exposed to sediments from

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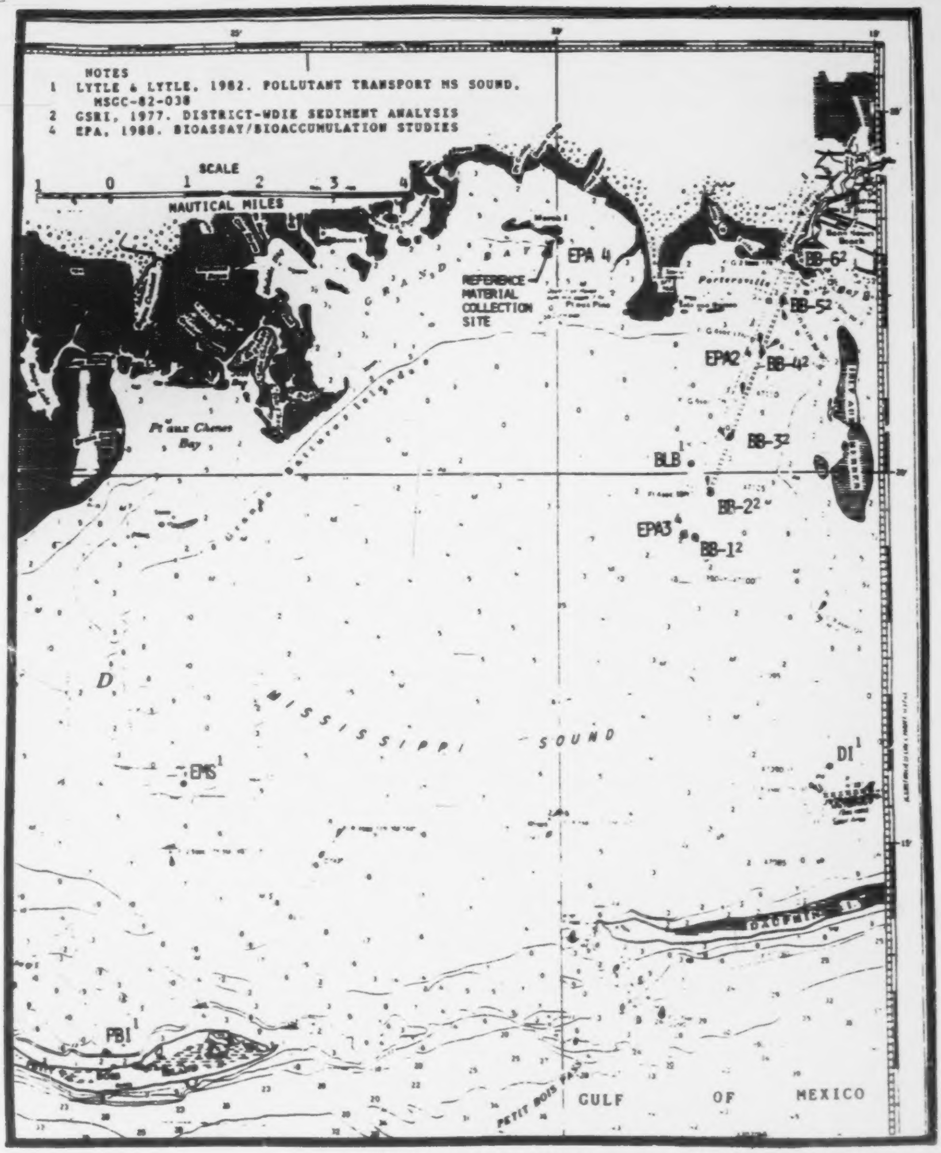
[14] Gulf South Research Institute, 1977.


NOTES
1 LYTLE & LYTLE, 1982. POLLUTANT TRANSPORT MS SOUND, MSGC-82-038
2 GSRI, 1977. DISTRICT-WDIE SEDIMENT ANALYSIS
4 EPA, 1988. BIOASSAY/BIOACCUMULATION STUDIES
SCALE
1 0 1 2 3 4
NAUTICAL MILES
GRAND BAY
REFERENCE MATERIAL COLLECTION SITE
EPA 4
BB-6²
Portersville
BB-5²
EPA2⁴
BB-4²
BB-3²
BLB¹
BB-2²
EPA3⁴
BB-1²
Pt aux Chenes Bay
D
MISSISSIPPI SOUND
EMS¹
DI¹
PB1¹
PETIT BOIS PASS
GULF OF MEXICO

WATER AND SEDIMENT QUALITY SAMPLING STATIONS
BAYOU LA BATRE, PORTERSVILLE BAY, GRAND BAY, AND MISSISSIPPI SOUND

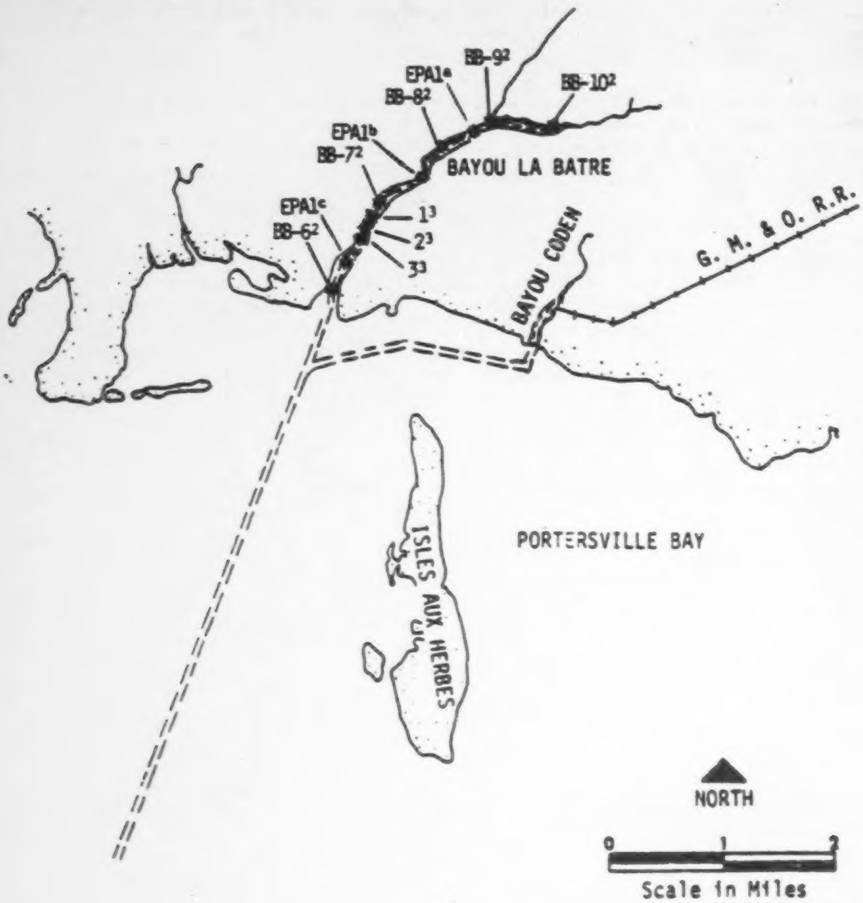
FIGURE 5

NOTES

1 LYTLE & LYTLE, 1982. POLLUTANT TRANSPORT MS SOUND, MASGC-82-038

2 GSRI, 1977. DISTRICT-WIDE SEDIMENT ANALYSIS

3 BA VITTOR, 1981. US MARINE (ICE) PERMIT APPLICATION


BB-9[2]
EPA1[a]
BB-8[2]
BB-10[2]
EPA1[b]
BB-7[2]
BAYOU LA BATRE
EPA1[c]
BB-6[2]
1[3]
2[3]
3[3]
BAYOU CODEN
G. M. & O. R.R.
PORTERSVILLE BAY
ISLES AUX HERBES
NORTH
0
1
2
Scale in Miles

WATER AND SEDIMENT QUALITY SAMPLING STATIONS

BAYOU LA BATRE AND PORTERSVILLE BAY

FIGURE 6

sites 1 or 2 than concentrations of these metals in animals exposed to reference sediment.

Petroleum hydrocarbon residues were detected in some tissues of some lugworms, shrimp, and oyster, but there were no statistically significant differences between reference and test animals. The results of this study are presented in Appendix D to this report.

Trace metal concentrations in offshore sediments are generally variable across the Continental shelf off the Mississippi and Alabama coast, with highest concentrations occurring near the Mississippi Delta and lower concentrations east of the Alabama coast[15]. Highest metal concentrations exist in the fine-grained, organically rich sediments.

Studies in the vicinity of the offshore disposal sites at Mobile and Pascagoula indicate that sediments in these areas exhibit slightly higher concentrations of mercury, cadmium, and arsenic than the crustal average. Lead, copper, zinc, nickel, chromium, iron, and barium levels were lower than average crustal abundance. PCBs and pesticides were not typically detected in sediments of these areas; however, DDT, DDE, and DDD were found in measurable amounts in the Mobile offshore disposal area and Heptachlor has been reported from the Pascagoula site. Aliphatic high molecular weight hydrocarbons range from 0.070 to 3.78 ppm and indicate three possible sources: fuel oils, marine organisms, and terrestrial plants. At the Pascagoula offshore site, data suggests that anthropogenic source (fuel oils) supplied a significant fraction of total aliphatic hydrocarbons. Aromatic hydrocarbon concentration at the Pascagoula site ranged from 0.006 to 1.14 ppm with very small concentrations of polynuclear aromatics which are characteristic of petroleum hydrocarbons. High molecular weight hydrocarbon concentrations from the Mobile offshore site exhibit similar trends[16].

4. Groundwater Resources. The principal sources of groundwater in Mobile County are the Miocene-Pliocene and alluvial aquifers. The Miocene-Pliocene aquifer consists of sediments belonging to the Miocene Series undifferentiated and the Citronelle Formation of Pliocene age. Although the Miocene and Pliocene sediments are separate geologic units in southern Alabama, they are grouped together as one aquifer because the geologic contact between the units is difficult to determine and because the units are often hydraulically connected. The alluvial aquifer consists of Quaternary-age channel and flood-plain deposits bordering the Mobile River.

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[15] Dames and Moore, 1979.

[16] Harmon Engineering and Testing, 1984 a, b.

The individual sand beds in the Miocene-Pliocene aquifer system are typically 50 to 100 feet thick and yield as much as 700 gal/min to properly constructed wells. Wells tapping the Miocene-Pliocene aquifer range in depth from about 100 to 800 feet[17]. The water in this aquifer generally is soft and low in dissolved solids but may contain iron in excess of 0.3 mg/l (EPA standard for drinking water) and may be sufficiently acidic to be corrosive. In areas adjacent to the Mobile River, Mobile Bay, and Mississippi Sound, water may have a dissolved solids content that exceeds 1,000 mg/l, a sulfurous odor, and a chloride content that exceeds 500 mg/l[18].

The sands of the alluvial aquifer range from 0 to 46 feet in thickness and typically yield 10 gal/min where saturated sands are of sufficient thickness. Water is generally suitable for most uses but may contain iron in excess of 0.3 mg/l and may be sufficiently acidic to be corrosive. Locally, in areas close to Mobile Bay and Mississippi Sound, water is very hard with iron in excess of 0.3 mg/l, chlorides in excess of 250 mg/l, and dissolved solids in excess of 1000 mg/l[19].

The City of Bayou La Batre water system currently has a capacity of up to 2 million gallons per day supplied from wells. Process water for the seafood processing houses is normally supplied from individual wells however sometimes city water is used in conjunction with well water.

5. Water Quality. Surface water quality is highly variable and dependent upon several factors including nonpoint and point source municipal and industrial loadings and their respective quality, rainfall, urbanization and concentration, and degree of dilution and/or mixing by estuarine waters. The water quality within the study is generally classified for recreation, fish and wildlife, and shellfish harvesting. However, the bayou and nearshore have poor water quality due to runoff which contains organic loadings. Due to degraded water quality, especially elevated fecal coliform bacteria counts, the bayou and adjacent waters are closed to shellfish harvest.

The 'dead-end canal' nature of the bayou tends to limit flushing and promote thermal stratification. This, in combination with the highly organic nature of the sediments, results in naturally low dissolved oxygen levels at certain times of the year. For example, according to Alabama Department of Environmental Management studies, dissolved oxygen concentrations in June and July, 1986, were 0.2 and 0.6 mg/l, respectively. The yearly average concentration was 4.0 mg/l. In July and August, 1987, dissolved oxygen concentrations were 0.0 mg/l. The 1987 yearly average concentration was 1.9 mg/l[20].

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[17] Hinkle and Dark, 1981.

[18] Reed and McCain, 1982.

[19] O'Neil and Mettee, 1982.

The major problem with the sewage treatment facility is caused by regulations that require the seafood processing houses to put the process waters into the sewage collection and treatment system. These waters are characterized by extremely high biological oxygen demand and organic content. When the houses are operating, the volume of water supplied to the system is above that which the facility was designed to handle. In an effort to correct this problem alternate methods of handling the process water are being developed. At this time one outfall line for process water has been constructed by a private entity and another line is under construction by a consortium of seafood processors. This second line which will be operated and maintained by the City of Bayou La Batre has an interim design capacity of 2.3 million gallons and an ultimate load capacity of 7.2 million gallons.

In addition to the construction of the outfall lines for the process water, the treatment facility is being upgraded with the addition of sludge drying beds. It is felt that when the process water is removed from the sewage collection system that the treatment facility would meet compliance standards. It is also possible that some additional capacity may be gained with this upgrading[21].

Dissolved oxygen concentrations within the sound typically vary between 7 mg/l to 12 mg/l (saturation) during the spring, and between 6 mg/l to 12 mg/l during the summer, reflecting dilution of the various oxygen demanding wastes entering the sound. Nutrient values are highly variable, both temporally and spatially, in response to freshwater inflow and seasonal factors. PH values tend to be highest in winter and lowest in late summer and early fall. Nitrite-nitrogen is lowest in winter and summer with maxima occurring in the spring while nitrate-nitrogen is highest in winter and spring with summer and fall levels being much lower. Orthophosphate tends to be highest in spring and summer with a pronounced east to west decline in concentrations. Orthophosphates reach highest levels during spring and summer while total phosphates reached highest concentrations in summer with the lowest values occurring in fall and winter[22].

Salinity values within the study area are highly variable.

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[20] U.S. Fish and Wildlife Service, 1988.

[21] C. Bryant, Personal Communication.

[22] Eleuterius, C., 1979.

During spring high freshwater inflow periods, salinities vary between 1 and 20 parts per thousand (ppt) with a general decreasing trend from east to west in Mississippi Sound. The summer lower inflow period can range between 5 to 29 ppt exhibiting the same decreasing trend as the spring. The system is well-mixed throughout the water column except within the navigation channels and barrier island passes [23]. Salinities in the nearshore Gulf of Mexico are more oceanic in nature ranging around 20 to 35 ppt with stratification being temporarily variable.

Dissolved oxygen (DO) concentrations in the nearshore Gulf of Mexico have been shown to exhibit some seasonal variation with low DO values prevalent during late summer months. These low values are attributed to stratification and isolation of bottom waters from surface waters, turbidity, and organic loading. Hydrographic studies performed during April and August, 1983 in the vicinity of the Pascagoula and Mobile ocean disposal sites indicated minor stratification. Surface DO levels ranged from 7.0 to 9.8 mg/l while bottom DO level ranged from 4.6 to 9.1 mg/l. Mean annual DO concentrations range from 6 to 9 mg/l throughout the region[24].

Water quality in the Gulf of Mexico is good. Analysis of selected metals, nutrients, pesticides, PCBs, and high molecular weight hydrocarbons from waters in the vicinity of the ocean disposal sites at Pascagoula and Mobile during 1983 resulted in trace levels which were comparable to and acceptable with EPA established standards[25]. No significant concentrations of the analytes investigated were detected within these areas.

6. Circulation. Circulation patterns within the study area are controlled by astronomical tides, winds, and, to a lesser degree, freshwater discharge. In Mississippi Sound and adjacent gulf waters the tidal variation is diurnal with an average period of 24.8 hours. The tidal wave progresses from south to north and enters the sound first through Horn Island Pass near Pascagoula, Mississippi and splits, traveling both eastward and westward causing as much as a 6-hour phase shift within Mississippi Sound. The eastward progressing high water reaches Pass aux Herons approximately one hour after entering the sound. On the flood tide, water enters through Petit Bois Pass and is deflected eastward toward Mobile Bay. On the ebb tide, water from eastern Mississippi Sound flows southwest through the Pass. In addition some water from Mobile Bay moves through Pass aux Herons into eastern Mississippi Sound.

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[23] Kjerfve, 1983.

[24] Harmon Engineering and Testing, 1984 a., b.

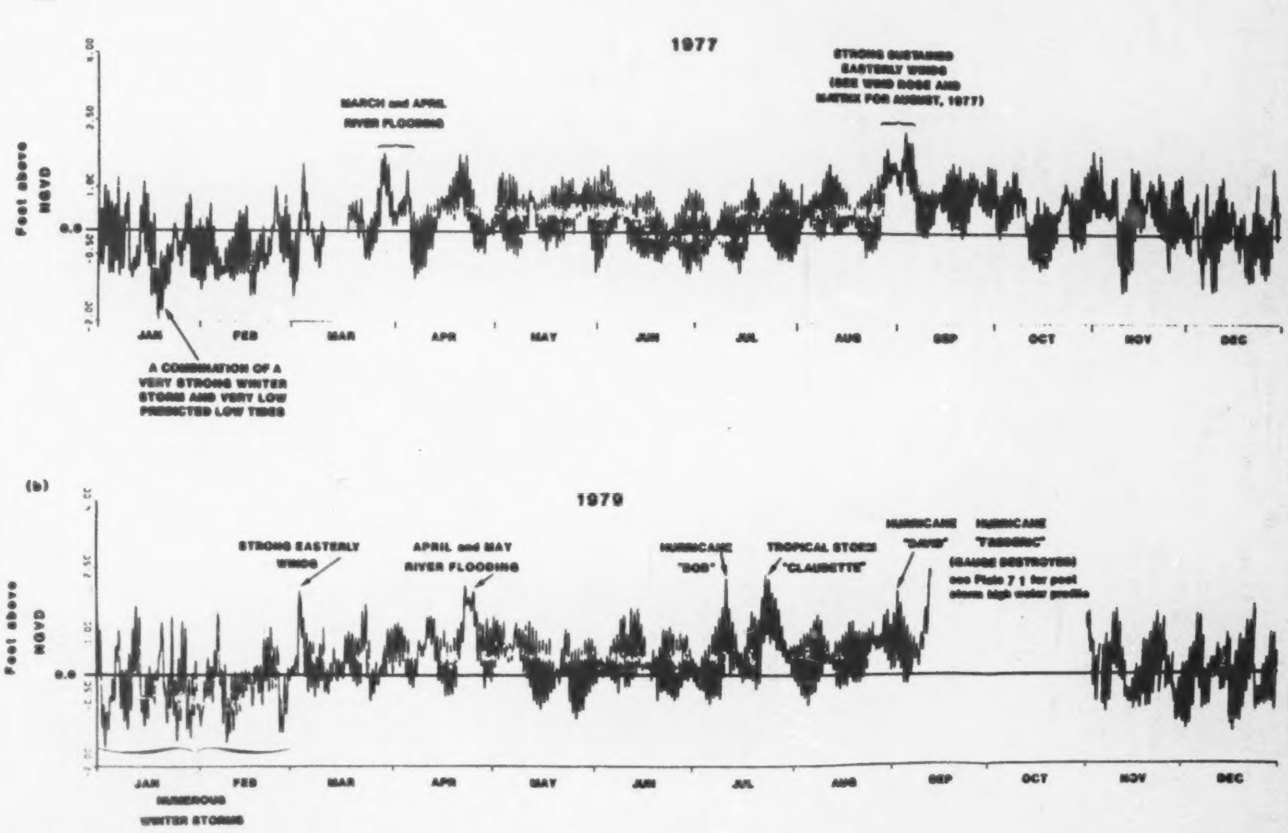
[25] Harmon, 1984 a., b., Op. cit.

The effect of the wind on circulation in this area is significant. The superimposed wind-induced current shifts the bifurcation area at Horn Island Pass either toward the east or west depending on the east/west wind component and whether the tide is ebbing or flooding. A wind with an eastern component induces a general westward current in the sound causing the bifurcation area to shift to the east (Petit Bois Pass) during the flood tide and to the west (Dog Keys Pass) on the ebb. Winds with a western component set up a general eastward circulation pattern in the sound. Winds with dominant north and south components have minimal effect on the overall circulation pattern, however may have significant localized effects. These wind components cause the development of eddies within the shallower areas of the sound tending to disrupt and diffuse tidal currents. These eddies have been shown to be strongest in the eastern half of the sound including the study area.

Winds with strong northerly or southerly components have a significant effect on water surface elevation within Mississippi Sound. Northerly winds tend to depress water levels while southerly winds raise water levels. Schroeder and Wiseman (1985) analyzed wind (1974-1984) and sea level elevations (1972-1983) in coastal Alabama and found that the passage of winter cold fronts (also called northers) during October through March could cause significant perturbations in sea level. Huh et al (1984) (in Schroeder and Wiseman, 1985) noted that the winter cold front storms occurred in a three phase cycle: prefrontal, frontal passage, and cold-air outbreak/high pressure. The prefrontal phase is characterized by falling barometric pressure, strengthening of southerly winds, and warm, moist air conditions. The frontal passage involves an abrupt reversal of these conditions accompanied by a squall line passage, strong wind shear, precipitation, and a rapid drop in air temperature. During the cold-air outbreak/high-pressure phase, pressure rises rapidly and strong winds rotate from northwest to northeast. Seas and sea level set up by the prefrontal southerly winds and falling atmospheric pressure, are set down by the strong northerly winds and rising pressure. Differences in sea level elevation between prefrontal set up and post-frontal set down are commonly 2.5 to 3.0 feet and occur over periods of 12 to 24 hours. Schroeder and Wiseman show the impacts of winter cold fronts, tropical cyclones, strong easterly winds, and river flooding in Figure 7. The impacts of numerous winter storms are depicted during January and February of 1979 and a very low sea level elevation (-2 feet NGVD) was recorded in January 1977 when a strong winter storm occurred during a period of predicted very low tides.

Water velocities range between 0 to 3 feet per second (fps) in the barrier island passes and between 0 to 0.8 fps in the sound. The region east of Petit Bois Pass has higher velocities while velocities near the Pascagoula area are in the lowest. Generally, peak velocities throughout the sound will increase by 40 percent per one foot increase in the tidal range. East/west

Plots of hourly observations of sea level elevation for (a) 1977 and (b) 1979.
(from: Schroeder and Wiseman, 1985)



HOURLY OBSERVATIONS OF SEA LEVEL FIGURE 7 wind components tend to increase velocities in the sound between Biloxi, Mississippi and Mobile Bay. North/south wind components have small, localized, erratic effects on water velocities.

Within the gulf, south of the barrier islands to the 120-foot depth contour, meteorological forcing results from (1) the daily, land-sea breeze cycle and associated small pressure changes, and (2) the passage of fronts. The dominant force to the system results from the passage of fronts. Dimego et. al. (1976) in Kjerfve (1984) report that roughly 8 frontal passages per month can be expected within the Gulf between November and January (winter), 6 frontal passages per month between March and May (spring), and 2 weak, slow-moving frontal passages per month between July and September (summer). During the winter, the fronts are highly energetic with respect to wind and atmospheric pressure due to the sharp contrast between the adjoining air masses and the passage of pressure system centers through the region. The spring fronts are still highly energetic but the typical ground track of their low pressure centers is slightly north of the region. The summer frontal passages are less frequent, traveling along paths well north of the region and exerting very little influence within the Gulf.

Wave intensity on the Mississippi-Alabama shelf is low to moderate with wave periods ranging from three to eight seconds and wave heights rarely over 7 feet. Hurricane or storm conditions, however, may produce larger waves.

7. Shoreline Erosion. Prevailing southerly and southeasterly winds strike the barrier islands at an angle and generate waves which result in a net westerly-flowing nearshore current on the seaward side of the barrier islands. These currents normally flow at about 1 to 2.5 knots, although on incoming tides this may be increased to 2.5 to 5.0 knots. Longshore drift of shoreline sediments shows a definite westward trend and erosion is active on the eastern ends of the islands, while accretion is taking place on the western ends.

The major factors affecting the erosional trend of the barrier islands are the deficiency in sediment supply, high frequency impact of hurricanes, and sea level changes. Comparison of historic shorelines indicates short-term cycles of erosion related to storms and only partial recovery during intermediate years of low storm incidence[18]. The dredging of natural passes has interrupted littoral drift by impoundment of sand in the channels and it is reasonable to expect that any sand trapped by the channels results in downdrift erosion.

The shoreline of Dauphin Island has experienced a general trend of erosion along the gulf and an accretionary trend on the western end of the island. The earliest known maps, of French origin, indicate that around 1717 Dauphin and Petit Bois Islands were connected. At some later date the island was breached. Between 1909 and 1917, a hurricane breached Dauphin Island, dividing it into two smaller islands, separated by over 5 miles of water, and scattered remnants of the former island. Between 1917 and 1942, the hurricane created tidal inlet filled with sediment. The island was again breached by the hurricane of September 1948, and aerial photos taken in March 1950 indicate that by that time the island was rejoined. Erosional rates determined from coastal charts for the entire gulf shore during the period 1942 and 1974 averaged 209 feet, or 6.3 feet per year. Accretion on the western end added a total of 1.8 miles to the length of Dauphin Island from 1917 to 1974[27]. During this same time period the eastern end of Petit Bois Island eroded a total of 2.5 miles. Extension of the time period to 1848 (i.e. 1848 -1973) indicates that over 7.5 miles (322 feet per year) was eroded from the eastern end of Petit Bois while the western end accreted approximately 2.8 miles (118 feet per year) (Figure 8). Horn Island appears more stable with approximately equal rates of erosion and accretion, 119 and 125 feet per year, respectively [28]. It should be noted that the western end of Petit Bois Island impinges into the Pascagoula Ship Channel such that it's westward accretionary trend is restricted.

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[18] Waller and Malbrough, 1976.

Concurrent with the accretionary trend of the western tip of Dauphin Island, the configuration of Petit Bois Pass which separates Dauphin and Petit Bois Islands, has shown a widening and westward migration (Figure 8). The width of the pass has varied from 1.65 miles in 1848 to 4.7 miles in 1974. During this same interval the pass migrated more than 6 miles, center to center[29].

The changes in the barrier islands and Petit Bois Pass have resulted in erosion of the Isle aux Dames/Point aux Pins area and Isle aux Herbes (Coffee Island). Figure 9 shows the progressive erosion of these areas. On the 1847/50 charts, the Isle aux Dames/Point aux Pins shoreline was approximately 2 miles long. By 1917, this area had decreased to approximately 1.5 miles and in 1957 approximately one mile of shoreline, principally along Point aux Pins, remained. Today, all that remains of Isle aux Dames is a series of sand bars. A publication by the Alabama Department of Economic and Community Affairs (n. d.) on coastal Alabama shoreline erosion indicates that between 1917 and 1958, Isle aux Dames lost approximately 276 feet or 6.7 feet of shoreline per year; Point aux Pins, at range line, lost 236 feet

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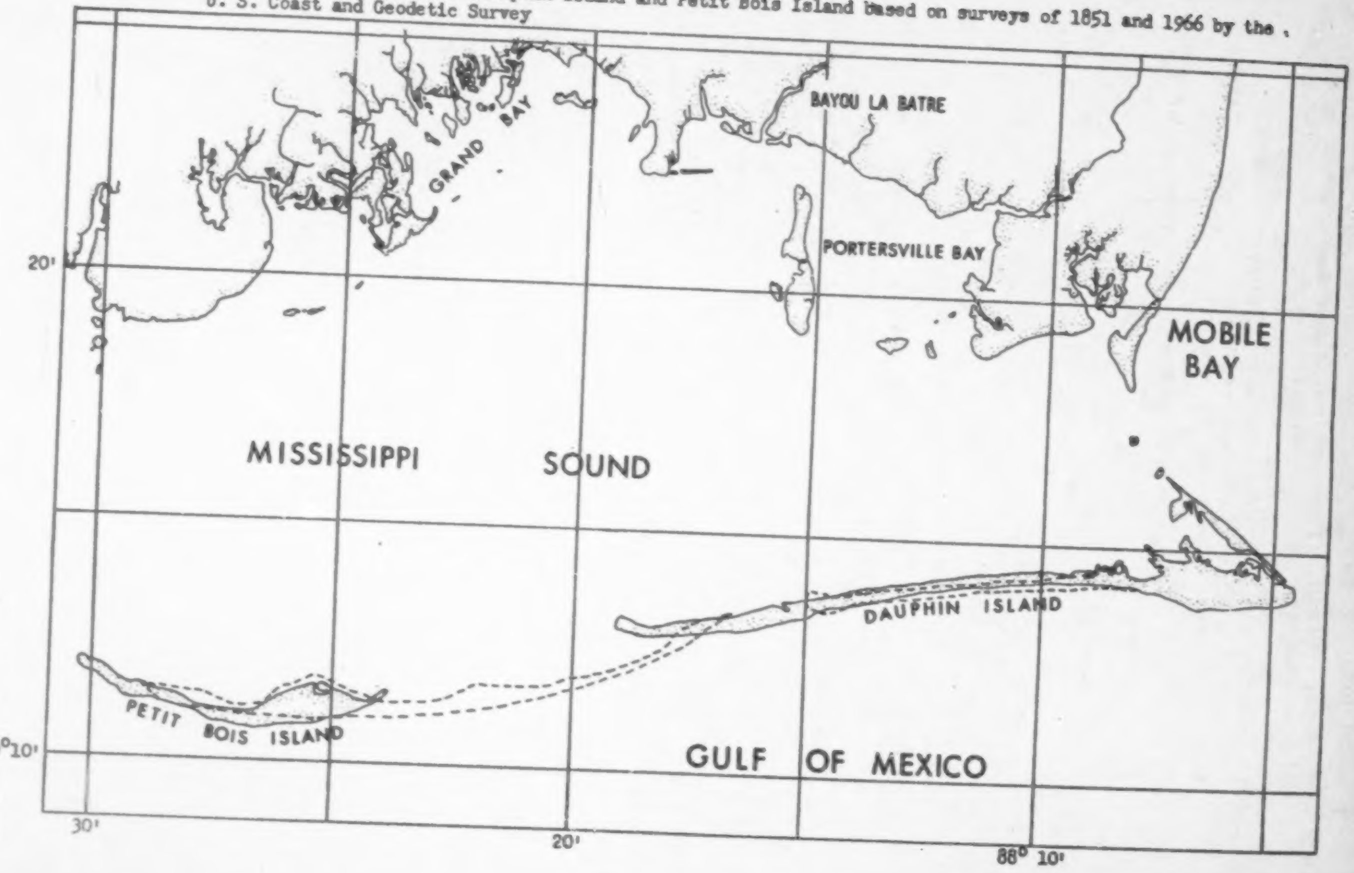
[27] Hardin *et. al*., 1976.

[28] Waller and Malbrough, 1976, *Op. cit*.

[29] Hardin *et. al*., 1976.

The relative positions of Dauphin Island and Petit Bois Island based on surveys of 1851 and 1966 by the U. S. Coast and Geodetic Survey


GRAND BAY
BAYOU LA BATRE
PORTERSVILLE BAY
MOBILE BAY
MISSISSIPPI SOUND
DAUPHIN ISLAND
PETIT BOIS ISLAND
GULF OF MEXICO
20'
30°10'
30'
20'
88° 10'

RELATIVE POSITIONS OF
DAUPHIN ISLAND AND PETIT BOIS ISLAND

FIGURE 8

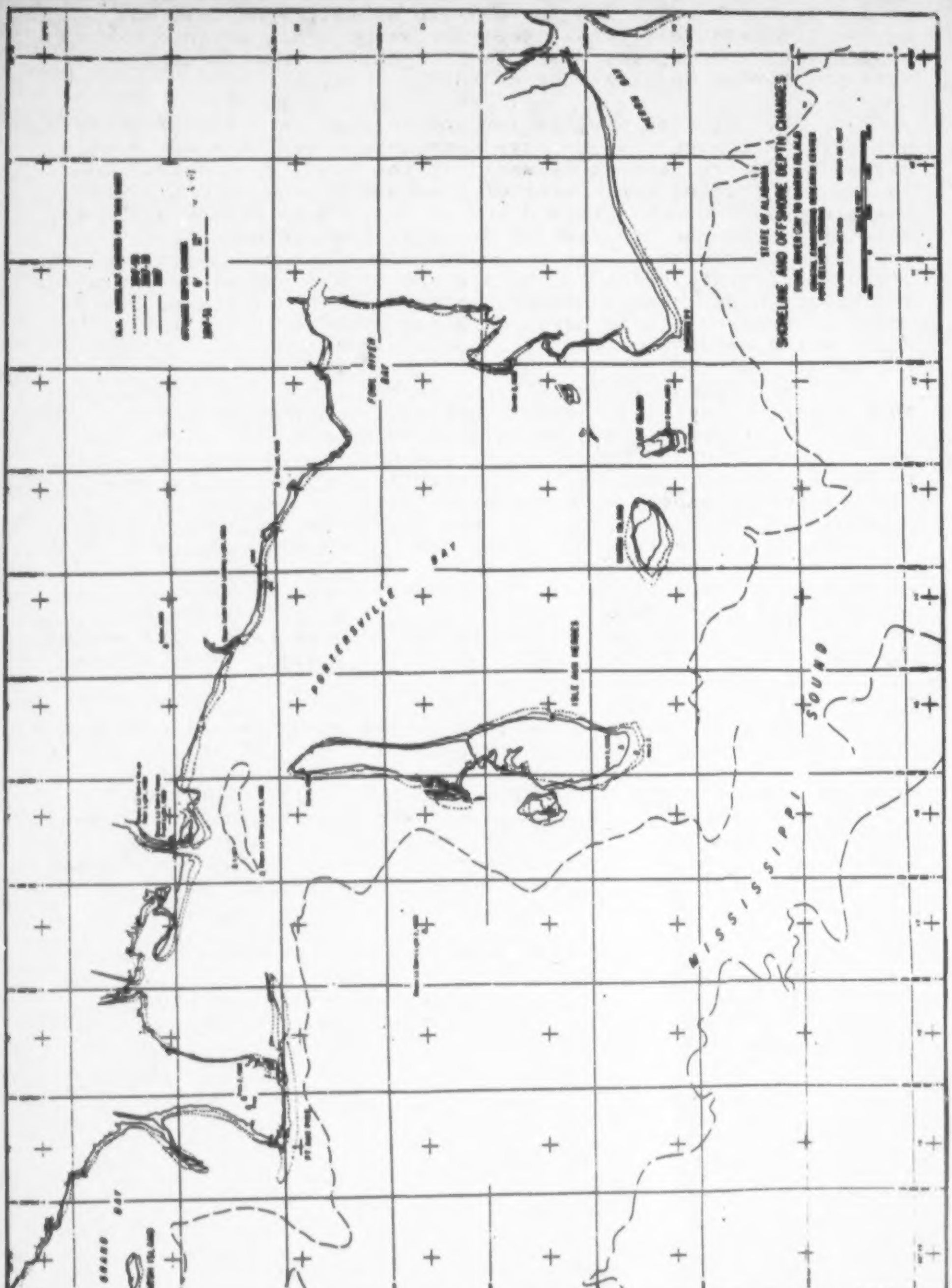

STATE OF ALABAMA
SHORELINE AND OFFSHORE DEPTH CHANGES
FOWL RIVER BAY
PORTERSVILLE BAY
ISLE AUX HERBES
MISSISSIPPI SOUND
GRAND BAY

FIGURE 9

or 5.8 feet per year; and the eastern shoreline of Isle aux Herbes lost 236 feet or 5.8 feet per year. This article also states that approximately 325 feet of the southwestern shore of Isle aux Herbes was lost during this period.

8. Mineral Exploration and Production. Significant natural gas concentrations have been discovered in lower Mobile Bay and offshore Dauphin Island. In the study area existing leases are located south west of Isle aux Herbes, north of the western end of Dauphin Island and in Petit Bois Pass. All the remaining areas in Mississippi Sound in Alabama have been nominated for lease in the upcoming sale. Representatives of the Division of State Lands in the Alabama Department of Conservation and Natural Resources indicated that provision of the proposed channel improvements to Bayou La Batre would not conflict with exploration or development of these areas[30].

9. Climate. The study area has a humid, temperate to subtropical climate, although occasional subfreezing temperatures occur. Air temperatures are influenced by the Gulf of Mexico, with average annual temperatures ranging between 60° Fahrenheit to 70° F. Summer temperatures are influenced by the Bermuda High, a semipermanent high-pressure cell that extends over portions of the Gulf of Mexico near 30° North latitude. During the summer, southerly winds generated by the high-pressure cell have a high moisture content which tends to keep coastal temperatures lower than those of inland areas. Summer temperatures range from a low of 70° F to a high of 90° F. In the winter, winds are northerly and move in cold, continental air masses. Temperatures remain relatively mild, ranging from lows in the 40's to highs in 60's F.

The normal annual rainfall within the study area is among the highest in the United States, averaging between 55 to 64 inches. Rainfall is fairly evenly distributed over the year, being greatest during the thunderstorm season in July, averaging 7.6 inches, and least in October and November, averaging 3.5 inches. Thunderstorm frequency is one of the highest in the United States. Relative humidity is fairly constant throughout the day and year. Humidity is usually highest between 2400 and 0600 hours (83%) and lowest between 1200 and 2000 hours (62%)[31].

10. Air Quality. Air quality for the Bayou La Batre area is good. Cloudiness tends to be highest in the winter and summer with lower values in the spring and fall. Much of the summer cloudiness consists of convective cumulus or high, thin

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[30] Bob McCrory, Personal Communication.

[31] O'Neil and Mettee, 1982.

clouds. Winter cloudiness is generally associated with movement of extratropical cyclones and their associated frontal systems. Periods of low visibility from November through May correspond with heavy fog periods. Heavy rains and high humidity during the summer are responsible for occasional low visibility.

11. Winds. Although wind direction is variable throughout the year, the overall circulation pattern brings about prevailing northerly winds from September through February and southerly winds the remainder of the year. See Table III.

TABLE III
MOBILE, ALABAMA WIND DATA

	JAN	FEB	MAR	APR	MAY	JUN
Direction[1]	N	N	S	S	S	S
Velocity[2]	8.0	8.2	8.4	8.3	7.7	6.9

	JUL	AUG	SEP	OCT	NOV	DEC
Direction[1]	SW	SW	N	N	N	N
Velocity[2]	6.5	6.4	6.8	7.3	7.6	7.8

[1] Direction of prevailing wind.
[2] Average hourly wind velocity in knots.

The percentage of time that winds from 0 to 3 knots prevail is 13.8%. Winds less than 7 knots occur 32% of the time; winds less than 11 knots occur greater than 72% of the time; and winds less than 17 knots occur more than 94% of the time. The time attributable to winds of 17 knots (near 20 m.p.h.) or greater is less than 6 percent[12].

12. Hurricanes. Hurricanes are a classification of tropical cyclone which are defined as nonfrontal, low pressure synoptic scale (large scale) systems that develop over tropical or subtropical waters and have a definite organized circulation. The classification of tropical cyclones into tropical depressions, tropical storms, or hurricanes depends upon the speed of the sustained (one-minute average) surface wind near the center of the system and are $\leq$ 33 knots, 34 to 63 knots inclusive or $\geq$ 64 knots, respectively.

The geographical areas affected by tropical cyclones are referred to as tropical cyclone basins. The Atlantic tropical cyclone basin is one of six in the world and includes much of the North Atlantic Ocean, the Caribbean Sea and the Gulf of Mexico. The official North Atlantic hurricane season begins on June 1 and extends through November 30 of each year; however, occasional tropical cyclones occur outside of this period.

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[12] Eleuterius, C., 1978.

Early season tropical cyclones are almost exclusively confined to the western Caribbean and the Gulf of Mexico. However, by the end of June or early July, the area of formation gradually shifts eastward, with a slight decline in the overall frequency of storms. By late July, the frequency gradually increases, and the area of formation shifts still further eastward. By late August, tropical cyclones form over a broad area which extends eastward to near the Cape Verde Islands off the coast of Africa. The period from about August 20 through about September 15 encompasses the maximum of the Cape Verde type storms, many of which travel across the entire Atlantic Ocean. Hurricane Frederic, which struck the Alabama coastline in 1979 was a Cape Verde hurricane. After mid-September, the frequency begins to decline and the formative area retreats westward. By early October, the area is generally confined to longitudes west of 60 degrees West, and the area of maximum occurrence returns to the western Caribbean. In November, the frequency of tropical cyclone formation further declines[33].

The central Gulf of Mexico is one of the more hurricane vulnerable locations along the coastline of the United States. Records of tropical cyclone occurrences for the central gulf coast have been compiled dating back to 1872. Although other researchers have compiled fragmentary data concerning tropical cyclone occurrences back to the late fifteenth century, the years from 1871 to the present represent the complete period of the development of meteorology and organized weather services in the United States. Since 1872, 84 tropical cyclones of at least tropical storm intensity (winds greater than 34 knots) have directly affected the central Gulf of Mexico coastline between Panama City, Florida and New Orleans, Louisiana. Of that number, 42 are known to have reached hurricane intensity. For the period 1872 - 1885, insufficient data exists to accurately determine which of the 13 tropical cyclones that occurred might have reached hurricane intensity; therefore, for the period of record, 42 hurricane occurrences for the central gulf coast is perhaps a conservative estimate. The vulnerability of the central gulf coast to hurricane strikes is well documented in the weather records. Over the 115-year period of record (1872-1987), the longest span of consecutive seasons without a hurricane striking the central gulf coast has been six years (1918-1923, inclusive)[34].

D. Biological Resources.

1. Land Use. The trend of urban development in Mobile

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[33] Neuman et. al., 1981.

[34] Mobile District, U.S. Army Corps of Engineers, 1986.

County has been toward the west of the city's population center. This pattern is enhanced by access to employment and retail centers afforded by Interstate Highways 10 and 65, as well as extension of water and sewer service to the Bayou La Batre area. Urban developed uplands comprise about 5 percent of the land within the delineated study area. Development of the Bayou La Batre area has occurred along both banks of the bayou and to the northwest along Highway 188. Waterfront land use is dominated by shipyard operations and seafood processing enterprises.

Although most of the bayou shoreline has been developed, some areas in the lower bayou remain undeveloped. Figure 10 shows these areas and illustrates the relative suitability for development in terms of potential impacts to existing wetlands. The provision of an improved channel into the bayou may result in increased pressure for the development of these areas and is discussed in the Environmental Impact Statement accompanying this report.

Estuarine open water areas dominate the delineated Bayou La Batre study area. These areas range in depth from less than one foot MLW to greater than 40 feet and contain a variety of resources important to the functioning of the ecosystem. Emergent wetlands, including estuarine and palustrine forms, comprise approximately 23,000 acres of the study area. Other important habitats in the area include submersed vegetation, forested wetlands, upland forests, and the beach/dune communities of the barrier islands. Table IV shows the distribution of habitat types in the area as defined on Figures 11 and 12. Numerous wildlife species, migratory waterfowl, and fish and shellfish species utilize these areas throughout their life cycles. In addition, a number of threatened or endangered species may occur within the area.

2. Emergent Wetlands. Emergent wetlands comprise about six percent of the wetlands in the study area. The greatest abundance of emergent wetlands in the study area is located along the shoreline of Point aux Chenes Bay, Portersville Bay in the Point aux Pins area and on Isle aux Herbes, Petit Bois Island and Dauphin Island. Within the Bayou La Batre study area, these wetlands are saline or brackish in nature and are dominated by black needlerush (Juncus roemerianus). Other common brackish marsh plants in the area include big cordgrass (Spartina cynosuroides), saltmeadow cordgrass (S. patens), and three square (Scirpus olneyi). Smooth cordgrass (Spartina alterniflora) exists as a narrow fringe along the open water margins. Unique habitats, known as salt flats or salt pannes occur within the saline marshes. These areas tend to retain water after heavy rains and storm tides and are characterized by barren areas interspersed with stands of Batis maritima, glasswort (Salicornia spp.) and sea bite (Suaeda linearis). Saltgrass (Distichlis spicata) typically surrounds the flat with runners extending into barren areas. During spring, the flats are covered by a layer of algae which dries during the summer giving the flat a caked appearance.

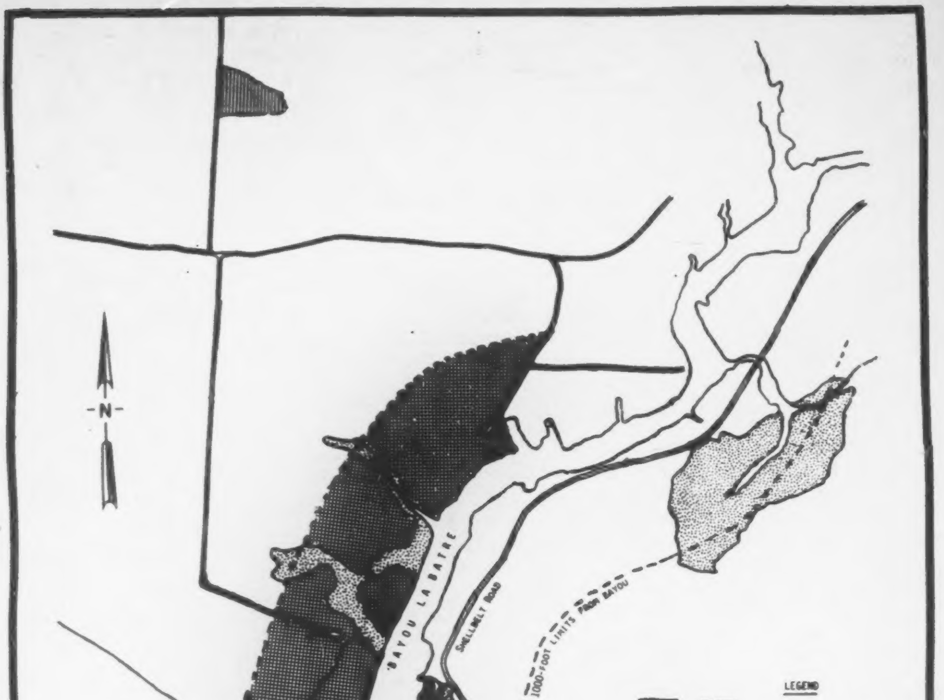
N
BAYOU LA BATRE
SHELLBELT ROAD
1000-FOOT LIMITS FROM BAYOU
LEGEND
UPLANDS
WETLANDS EXEMPTED FROM DEVELOPMENT CONSIDERATION
WETLANDS WITH PENDING APPLICATIONS
WETLANDS WITH HIGH POTENTIAL FOR WATER DEPENDENT DEVELOPMENT
WETLANDS WITH PRE-APPLICATION EVALUATIONS
500 0 500 1000
SCALE IN FEET
BAYOU LA BATRE, ALABAMA
FUTURE DEVELOPMENT CONSIDERATION
MISSISSIPPI SOUND

FIGURE 10

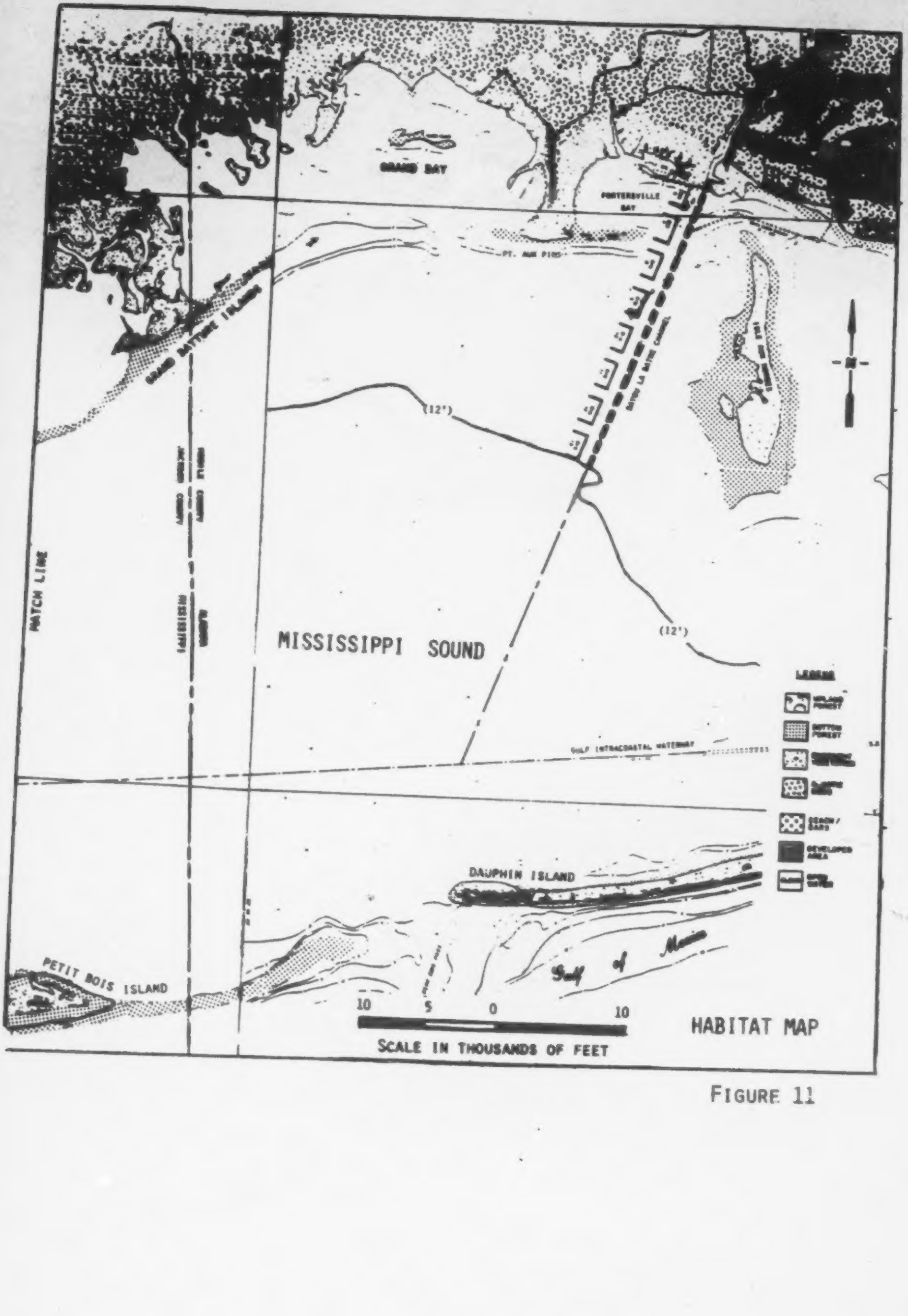
GRAND BAY
PORTERSVILLE BAY
PT. AUX PINS
GRAND BATTURE ISLANDS
BAYOU LA BATRE CHANNEL
N
MATCH LINE
MISSISSIPPI
ALABAMA
JACKSON COUNTY
MOBILE COUNTY
(12')
MISSISSIPPI SOUND
(12')
GULF INTRACOASTAL WATERWAY
LEGEND
UPLAND FOREST
BOTTOM FOREST
BEACH/BARS
DEVELOPED AREA
OPEN WATER
DAUPHIN ISLAND
PETIT BOIS ISLAND
Gulf of Mexico
10
5
0
10
SCALE IN THOUSANDS OF FEET
HABITAT MAP

FIGURE 11

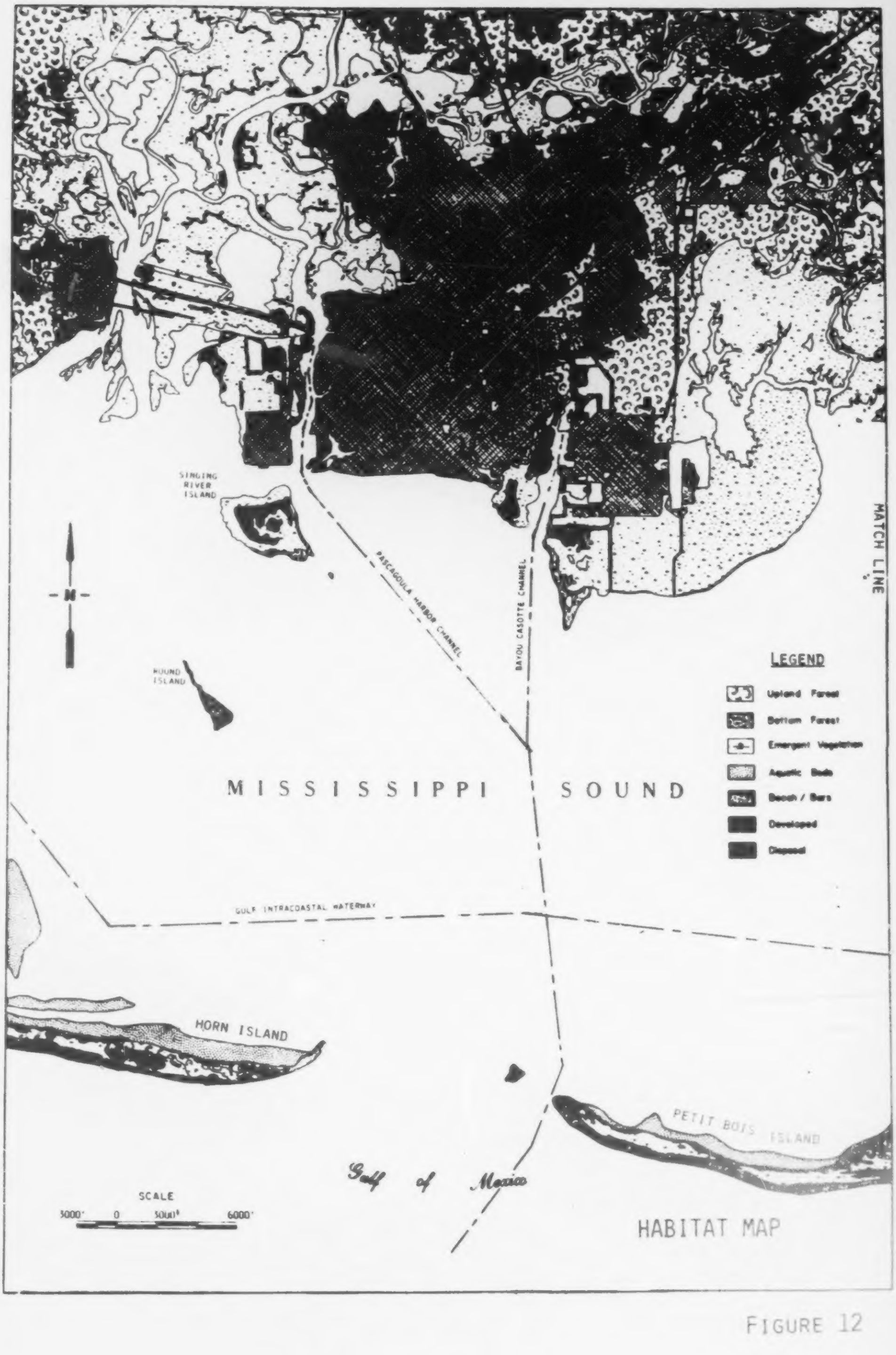
SINGING RIVER ISLAND
N
ROUND ISLAND
PASCAGOULA HARBOR CHANNEL
BAYOU CASOTTE CHANNEL
MATCH LINE
LEGEND
Upland Forest
Bottom Forest
Emergent Vegetation
Aquatic Beds
Beach / Bars
Developed
Disposal
MISSISSIPPI SOUND
GULF INTRACOASTAL WATERWAY
HORN ISLAND
PETIT BOIS ISLAND
Gulf of Mexico
SCALE
3000' 0 3000' 6000'
HABITAT MAP

FIGURE 12

3. *Aquatic Grassbeds and Tidal Flats*. Aquatic grassbeds and tidal flats comprise about 2.5 percent of the study area. The aquatic beds are located near the southeasternmost end of Portersville Bay, on the north sides of the barrier islands, and along both sides of Point aux Pins. Species present in these areas include Cuban shoal weed (*Halodule wrightii*), widgeon grass (*Ruppia maritima*), manatee grass (*Cymodocea manatorum*), turtle grass (*Thalassia testudinum*), and *Halophila englemanni*. Cuban shoal weed tends to be the dominate species within the study area[35]. Tidal flats and mud flats are located around the outer edge of Isle aux Herbes and along the shorelines of Portersville Bay, Petit Bois Island and Dauphin Island. These areas are considered intertidal and support bacteria, diatoms, unicellular algae, and diverse benthic communities.

4. *Barrier Islands*. The barrier islands of Alabama and Mississippi support two unique habitats: the maritime strand forest and the beach-dune association. The land-water interface along Petit Bois and Dauphin Islands is characterized by beach conditions. The beaches intergrade into dune conditions. These dunes are vegetated by sea oats (*Uniola paniculata*), morning glory (*Ipomoea spp.*), saw palmetto (*Serenoa repens*), and pennywort (*Hydrocotyle bonariensis*). The maritime forest is located in the interior of the islands and is characterized by scrubby live oak (*Quercus virginiana* var. *maritima*), myrtle oak (*Q. myrtifolia*), seaside rosemary (*Ceratiola ericoides*), and saw palmetto.

5. *Scrub/Shrub Wetlands*. Scrub/Shrub wetlands comprise about one percent of the habitat within the study area. These areas consist of woody vegetation less than 20 feet tall and are generally a transition zone between the emergent wetlands and upland areas. In some instances this habitat is found on areas that were disturbed and used for disposal areas. The scrub/shrub zone is dominated by sea myrtle (*Baccharis halimifolia*), wax myrtle (*Myrica cerifera*), and yaupon holly (*Ilex vomitoria*).

6. *Forested Wetlands*. Forested wetlands are characterized by woody vegetation that is taller than 20 feet. Generally, these wetlands consist of an overstory of trees with an understory of young trees or shrubs. These wetlands comprise about 3.5 percent of the habitat within the Bayou La Batre area. Broad-leaved deciduous and coniferous evergreens make up the forested wetlands within the area. These areas include such species as sweet bay (*Magnolia virginiana*), swamp bay (*Persea palustris*), water oak (*Quercus nigra*), and sweet gum (*Liquidambar styraciflua*). Bald cypress (*Taxodium distichum*)

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[35] U. S. Department of Interior, 1978.

TABLE IV
Habitat Distribution Within the Study Area
Bayou La Batre, Alabama

HABITAT TYPE	AREA (Acres)
Estuarine Subtidal Open Water	88,600
Marine Subtidal Open Water	5,946
Palustrine Open Water	49
Estuarine Aquatic Beds	1,284
Estuarine Intertidal Beach/Bar	18
Marine Intertidal Beach/Bar	724
Estuarine Intertidal Flats	2,500
Palustrine Flats	2
Estuarine Intertidal Forested	39
Estuarine Intertidal Emergent	22,050
Palustrine Emergent Wetlands	28
Estuarine Intertidal Scrub/Shrub	405
Palustrine Scrub/Shrub	556
Palustrine Forested	4,786
Upland Forested	4,977
Developed/Urbanized Uplands	7,483
Disposal Areas	250
TOTAL	139,697

Source: National Wetlands Inventory Maps (U. S. Fish and Wildlife Service, 1979)

occurs in the more highly saturated areas. Understory species occurring in these areas include swamp cyrilla (*Cyrilla racemiflora*), black titi (*Cliftonia monophylla*), and wax myrtle.

7. *Forested Uplands*. Forested uplands in the vicinity of Bayou La Batre are characterized by sweet gum, live oak (*Quercus virginiana*), long-leaf pine (*Pinus palustrus*), shortleaf pine (*P. elliottii*) and hickory (*Carya* sp.), gallberry (*Ilex* sp.), wax myrtle, greenbriar (*Smilax* sp.), and *Rubus* sp. Other uplands within the study area are used for farming and pecan groves.

8. *Open Water*. Open water comprises about 70 percent of the study area. These areas range in depth from less than one foot MLW to greater than 40 feet and contain a number of resources important to the economy of the region including blue crab, oyster, shrimp and finfish. Zooplankton, although extremely important to the functioning of the estuarine and coastal systems, are not well known in the study area. Copepods and ctenophores are the dominant forms, with *Acartia tonsa* being the most numerous of the copepods. Fish larvae and eggs are also

dominant items of the zooplankton during certain times of the year.

9. Benthic Habitats. A variety of habitat types occur in the open water areas due to salinity differences and dissimilarities in bottom sediment composition. The benthic habitats are populated by small invertebrate organisms collectively termed macroinfauna, including polychaetes and crustaceans. Table V indicates the relative abundance of the benthic communities described for the study area.

TABLE V
SELECTED BENTHIC COMMUNITY DISTRIBUTION WITHIN THE BAYOU LA BATRE STUDY AREA

COMMUNITY TYPE	AREA (Acres)
Coastal Margin Mud	17,920
Open Sound Muddy Sand	69,080
Shallow Sound Clean Sand	1,600
Tidal Pass Clean Sand	2,659
Offshore Clean Sand	3,598
Offshore Muddy Sand	2,348

Source: U. S. Army Corps of Engineers, 1982.

The coastal margin mud community occupies the bottoms adjacent to the mainland shore for a distance of approximately two miles south into Mississippi Sound. Species of this community are characteristic of shallow, muddy, hydrographically variable environments. The open sound muddy sand community occupies most of the Mississippi Sound portion of the study area extending seaward of the coastal margin to nearshore of the barrier islands. The increase in depth of this area over the coastal margin provides a hydrographically more stable environment. The offshore mud community is located nearshore to the barrier islands and is characterized by shallow, muddy, and hydrographically variable conditions similar to the coastal margin. The offshore muddy-sand habitat is located in deeper waters seaward of the offshore mud habitats. These areas are described by very fine sands and high and stable salinities.

Communities within the sand habitats of the area are characterized by an assemblage of ubiquitous taxa which respond to grain size of the sediments complemented by species which respond to variability in salinity. The shallow sound sand areas are characterized by salinities which fluctuate widely between brackish and marine conditions. The tidal pass and offshore sand areas are characterized by much more stable salinities although at certain times the tidal pass may fluctuate greatly.

Comparing the benthic communities, the open sound muddy sand communities contain approximately four times the number of organisms of the coastal margin communities and two times the density of the clean sand communities. Offshore mud and muddy sand communities have generally moderate densities and low biomass. In general, mud communities contain more polychaetes and the greatest proportion of the community is located at depths greater than 5 cm. The muddy sand communities contain a greater proportion of the individuals at depths less than 5 cm. Approximately 90% of the individuals in the sand communities occupy the upper 10 cm of sediment and this community contains more crustaceans than other communities[36].

10. Fish and Shellfish. The open water areas in the study area also support many of the commercially well known fish and invertebrate resources. These resources include shrimp, oysters, crabs and finfish. The major fisheries of the study area include menhaden (Brevoortia patronus), mullet (Mugil cephalus), croakers (Micropogonias undulatus and Leiostomus xanthurus), shrimp (Penaeus azetecus and P. setiferus), blue crab (Callinectus sapidus), and oyster (Crassostrea virginica). The Bayou La Batre area ranks in the top 20 for value of fishery landed at major U. S. ports. The seven year average (1980 through 1986) of landings and value were 20.2 million pounds and $31.8 million.

These species are estuarine dependent, i.e., they spend part or all of their lives in estuaries. A typical estuarine-dependent species spawns in the Gulf of Mexico and the larvae are then carried toward shore by currents. By the time the young are big enough to swim, they are near the mouths of estuaries, which they enter. The young remain in the estuaries for about one year, taking advantage of the greater availability of food and protection which estuarine habitats afford. Most estuarine-dependent species grow rapidly and reach maturity at one year of age. They may then remain in the estuary, migrate to sea to spawn (returning to the estuary between spawnings), or migrate from the shallow estuaries to spend the rest of their lives in the deeper Gulf of Mexico. Of course, other species may spend their entire life cycle within the estuary, while those that typically occur farther offshore may never be found in the estuaries[37].

The stages from the egg to juvenile, during which time transport from offshore waters to low salinity areas is accomplished, is probably the most critical of all in the life histories of the important fishery organisms of Mississippi sound and the Gulf of Mexico. The threat to individuals during this time may be broken down into three distinct phases: 1) transport from the offshore waters to the vicinity of the tidal passes or bay mouths; 2) transport through the passes into the bays; and 3) distribution within the bays after entrance has been obtained[38]. Since these forms are typically incapable of sustained locomotion, any change in normal current speed or direction would severely impact the growth of the species.

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[36] U. S. Army Corps of Engineers, 1982.

[37] Hoese and Moore, 1977.

The majority of the fish of the area spawn in the Gulf of Mexico from the nearshore waters of the barrier islands and tidal passes to depths in excess of 4,500 feet near the edge of the outer Continental Shelf. Spawning activities are more concentrated in depths less than 100 feet and particularly in the nearshore areas on the gulf side of the barrier islands and in the deeper waters of the tidal passes. In deeper water over 100 feet deep, spawning occurs in all months, probably due to the more stable temperature regime of those waters. In shallower waters, spawning activities are more concentrated in spring through summer months in response to warmer temperatures and variable salinity conditions. Larval migration into the estuaries is effected through the tidal passes, both in surface and bottom waters. Some species passively migrate utilizing flood tide currents, while others are able to migrate against ebbing currents. Migration typically begins in the early spring with larval and post larval stages moving through the tidal passes and into shallow areas of the estuary. In summer, many larvae and juveniles tend to move to somewhat deeper water and very heavy usage is seen in areas with submerged vegetation. The autumn migration of late juveniles is towards deeper waters within Mississippi Sound, into the tidal passes, and into shallow offshore gulf waters.

The vegetated wetlands along mainland margins of Mississippi Sound, including Portersville and Grand Bays, the margins of Petit Bois and Dauphin Islands, Point aux Pins and Isle aux Herbes, and the grassbeds adjacent to these areas serve as the dominant nursery grounds during spring and summer. In autumn, these areas are still important but usage is not as heavy due to the seaward migration of many late juveniles[39].

Although there are large areas within the eastern Mississippi Sound with bottoms suitable for oyster growth, notably Heron Bay, Portersville Bay, and Grand Bay, only low quantities of marketable oysters are produced. Historic mapping of the Alabama portion of the sound indicates that sizeable oyster reefs once existed in Portersville Bay prior to 1900. The lack of oyster production in these areas is likely due to increased salinities. The oyster can withstand wide fluctuations in salinity, however, many predators such as the oyster drill (Thais haemostoma) are restricted to areas of high salinity. With the increase in salinity in these areas over time, the oyster predators have reduced the size of the oyster reefs.

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[38] Gunter, 1967.

[39] Benson, 1982 and U. S. Army Corps of Engineers, 1984.

Brown and white shrimp shrimp and blue crab are commercially important estuarine dependent species. In the estuaries, post-larval and juvenile shrimp prefer soft bottom, shallow areas near emergent vegetation; adults prefer deeper areas with both mud and sandy bottoms[40]. Juvenile blue crabs live in the estuarine nursery grounds throughout the year, congregating in channels with soft mud sediments and in the saline and brackish marshes that fringe the bays and coastline. Juvenile crabs prefer lower salinities (5 to 15 ppt) and mud bottoms[41]. Adult crabs exhibit a differential distribution by sex with males tending to remain in lower salinity areas and females in water with salinities above 20 ppt. The adults tend to migrate into deeper waters with decreasing water temperatures in the late summer and fall.

11. Amphibians and Reptiles. A number of amphibians and reptiles occur in the diverse habitats of the study area, including salamanders, frogs, toads, snakes, and turtles. Of the five species of marine turtles, the green turtle (Chelonia mydas) and the Atlantic ridley (Lepidochelys kempi) may enter estuaries. The loggerhead turtle (Caretta caretta) in past years nested on the barrier islands but development and human disturbance have reduced their nesting. The gopher tortoise (Gopherus polyphemus) may utilize upland portions of the study area. Other species which are common in the area are diamondback terrapin (Malaclemys terrapin) and saltmarsh water snake (Nerodia fasciata clarki) in brackish marshes; alligator (Alligator mississippiensis), Florida cooter (Pseudemys floridana), in brackish water; and the box turtle (Terrapene carolina major) in upland areas.

12. Birds. The coastal marshes, swamps, islands, and beaches of the study area support large populations of passerine birds, waterfowl, wading birds, and shore birds. The shorebirds include least tern (Sterna albifrons), caspian tern (Hydroprogne caspia), laughing gull (Larus atricillus), brown pelican (Pelecanus occidentalis) and numerous species of sandpipers and plovers. Marshes and swamps provide habitat of many species including clapper rail (Rallus longirastris), Louisiana heron (Hydranassa tricolor), great blue heron (Ardea herodias) and snowy egret (Egretta thula). Passerine birds include seaside sparrow (Ammospiza maritima) and boat-tailed grackle (Cassidix major). A large nesting colony exists on Cat and Marsh Islands just east of the study area.

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[40] Van Lopik et. al., 1979.

[41] Benson, 1982, Op. cit.

13. *Mammals*. A number of coastal mammals may be found in the study area and include gray squirrel (*Sciurus carolinensis fuliginosus*), nutria (*Myocastor coypus bonariensis*), muskrat (*Ondatra zibethicus rivalicus*), raccoon (*Procyon lotor varius*), bobcat (*Odocoileus virginiana*), and marsh rabbit (*Sylvilagus palustris palustris*). The most common marine mammal occurring in the estuarine waters of Mississippi Sound is the Atlantic bottlenosed dolphin (*Tursiops truncatus*). Offshore mammals include dolphins, several species of whales and an occasional manatee (*Trichecus manatus latirostris*).

14. *Endangered and Threatened Species*. A number of species identified by the Department of the Interior as being endangered or threatened due to decreasing abundance or requiring a habitat that is threatened could possibly occur in the study area. In addition, the State of Alabama has published lists of threatened and endangered flora and fauna[42]. Some of these species are protected under Alabama Regulation 87-GF-7. The State of Mississippi, through the Mississippi Department of Wildlife Conservation (MDWC) and the Mississippi Natural Heritage Program (MNHP) has published lists of threatened and endangered plants and animals. The endangered species defined by MDWC are protected under Mississippi Statute 49-5-109. Table VI lists species, and their status, which could be impacted by the proposed action. Of particular interest are plant species unique to pitcher plant bogs/pine savannahs that are common in south Mobile County and organisms occurring within the coastal waters of Alabama and Mississippi.

In addition to these species, the Federally endangered jaguarundi (*Felis yagouaroundi*) may be present within the Bayou La Batre - Point aux Pins area. Although the presence of this mammal has not been substantiated by material evidence, it has been seen on four occasions[43]. Nothing is known about the jaguarundi's life history and ecology in Alabama; however, three of the four sightings were made in areas of densely vegetated habitat which suggests a preference for more isolated, swampy areas where human disturbance is minimal.

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[42] Mount, 1986.

[43] *Ibid*.

TABLE VI
ENDANGERED AND THREATENED SPECIES

		Status		
Scientific Name	Common Name	Federal	AL	MS
PLANTS				
Rhynchospora crinipes	Beakrush	-	E	n/a
Eriocaulon texenes	Pipewort	-	SC	n/a
Psoralea simplex	no common name	-	E	n/a
Hypericum nitidum	St. John's Wort	-	T	n/a
Hypericum reductum	St. John's Wort	-	SC	n/a
Ophioglossum nudicaule	Least adder's tongue	-	SC	n/a
Cleistes divaricata	Spreading pogonia	-	T	n/a
Platanthera integra	Yellow fringeless orchid	-	SC	n/a
Sarracenia psittacina	Pitcher plant	-	T	n/a
Selaginella ludoviciana	Spikemoss	-	SC	n/a
Xyris scabrifolia	Yellow-eyed grass	-	T	n/a
ANIMALS				
Scaphirhynchus sp.	Alabama shovelnose sturgeon	C	E^1	E
Ambystoma cingulatum	Flatwoods salamander	-	E	n/a
Caretta caretta	Atlantic loggerhead turtle	T	E^1	E
Chelonia mydas	Green sea turtle	T	E^1	E
Dermochelys coriacea	Leatherback sea turtle	E	E^1	E
Eretmochelys imbricata	Hawksbill turtle	E	E^1	E
Gopherus polyphemus	Gopher tortoise	E	-	n/a
Lepidochelys kempi	Kemps ridley turtle	E	E^1	E
Charadrius melodus	Piping plover	SC	E	n/a
Balaenoptera physalus	Finback whale	E	-	E
Megaptera novaeangliae	Humpback whale	E	-	E
Balaenoptera borealis	Sei whale	E	-	E

NOTES:
E = Endangered, T = Threatened, C = Candidate, SC = Special Concern, E^1 = species not protected under AL Regulation 87-GF-7, n/a = not applicable.

Only species which are associated with the coastal waters of Alabama and Mississippi have been included in this list.

E. Commercial Fishing and Shipbuilding Activities.

1. Commercial Fishing. As described earlier in this report, Bayou La Batre is one of the leading seafood ports in the United States. It is the largest volume seafood port in Alabama, accounting for over 85% of the state's quantity of seafood landed. Over 90% of Mobile County's total value of landings occur at Bayou La Batre. The primary seafood product landed and processed at Bayou La Batre is shrimp. Other products such as crab, oysters and some finfish are also handled but make up only about 11% of the total value. In addition to those quantities

landed, significant amounts of shrimp are trucked to Bayou La Batre from other ports for processing. In fact, some of the shrimp trucked to Bayou La Batre originates in foreign ports. The foreign shrimp normally enters the United States in large vessels through the ports of New Orleans or Miami.

In order to describe the existing commercial fishing activities at Bayou La Batre, it is necessary to recount in sufficient detail the characteristics, composition and capabilities of the fleet, processing enterprises, and the prime quarry, shrimp. It is the interaction of these elements that establish the existing structure of the commercial fishing activities at Bayou La Batre.

a. The Shrimp Resource. The shrimp resource in the Gulf of Mexico consists of three species: brown shrimp (Penaeus aztecus), white shrimp (Penaeus setiferus) and pink shrimp (Penaeus duorarum). Since the pink shrimp is of little economic importance to Bayou La Batre, this resource is not a part of the analysis. Areas of the Gulf of Mexico where the adult shrimp of each species are found depends heavily on the type of bottom sediment. The area of primary shrimp habitat and, consequently, the greatest quantity of shrimp extends from the Texas-Mexico border to just west of the Louisiana-Texas border. This area consists of mainly sand and finer grain sediments and expansive marsh areas favorable to the brown and white shrimp. A secondary area extending eastward to near Pascagoula, Mississippi is composed of finer grained material deposited by the Mississippi River and also holds the brown and white shrimp[44]. See Figure 13.

Brown shrimp spawn in the Gulf of Mexico from November to April, during which time the larvae migrate into estuaries and marshes where they grow and mature into adult shrimp. During the months May through August they migrate back offshore. It is during this outmigration that the shrimp catches are made. The peak months for the largest catch of brown shrimp within the Gulf of Mexico are June and July.

The white shrimp spawn in the Gulf of Mexico from March to October. Their migration from the estuaries occurs during the period June through November. Peak months for the white shrimp catch in the gulf are September and October.

b. Composition and Operational Characteristics of the Bayou La Batre Fishing Fleet The commercial fishing fleet utilizing the Port of Bayou La Batre each year is composed of both resident and transient vessels. Since the openings of the

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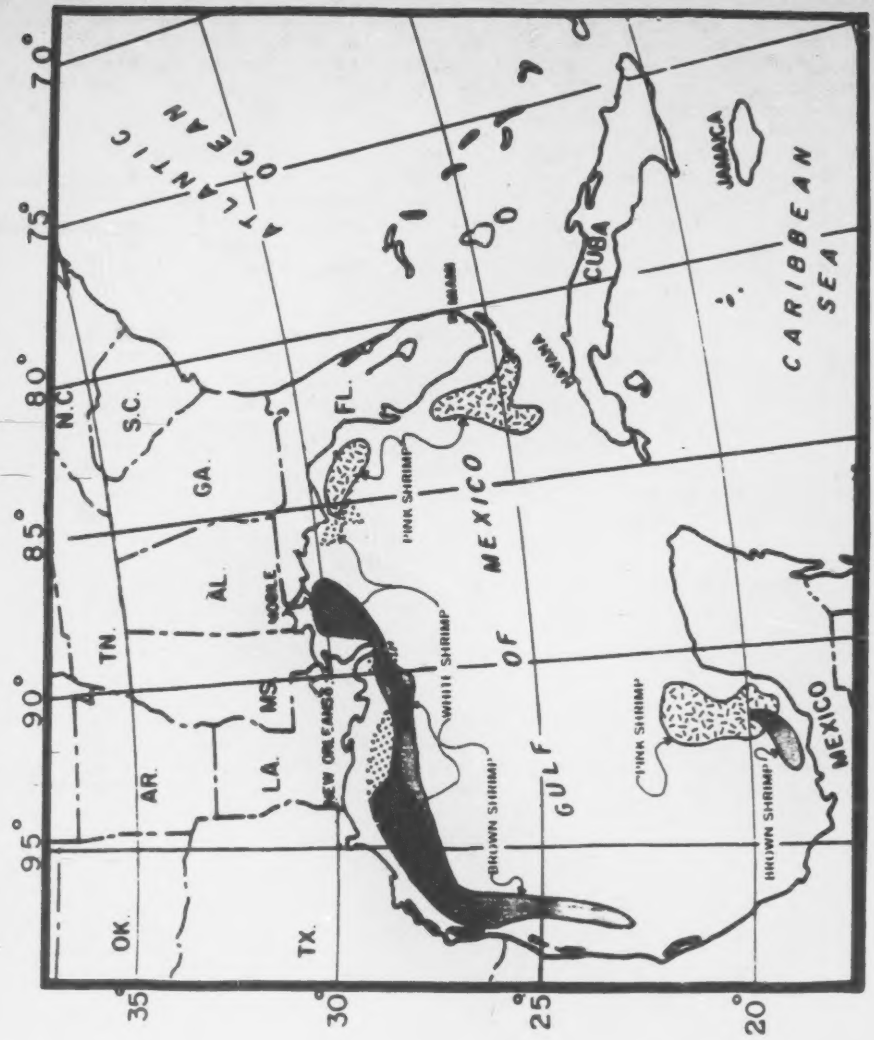
[44] Gulf of Mexico Fishery Management Council, November 1981.


70°
75°
80°
85°
90°
95°
35°
30°
25°
20°
ATLANTIC OCEAN
N.C.
S.C.
GA.
FL.
AL.
TN.
MS.
LA.
AR.
OK.
TX.
MOBILE
NEW ORLEANS
MIAMI
HAVANA
CUBA
JAMAICA
CARIBBEAN SEA
GULF OF MEXICO
PINK SHRIMP
WHITE SHRIMP
BROWN SHRIMP
PINK SHRIMP
BROWN SHRIMP
MEXICO

Source: National Marine Fisheries., 1972

SHRIMP GROUNDS IN GULF OF MEXICO

FIGURE 13

shrimping season vary in the different parts of the Gulf of Mexico, many shrimpers follow the seasons throughout the gulf and land their catch at the nearest available port.

Data obtained from field surveys during 1986 indicate that 504 resident vessels and 100 transient vessels utilize the port each year. The total fleet can be divided into two classes, gulf boats and bay boats. Although these classes are determined by operational patterns rather than by loaded draft, the bay boats operating at Bayou La Batre typically draft less than 10 feet loaded. Gulf boats make average 14-day trips and will range great distances in search of shrimp while the bay boats average 4-day trips that are limited primarily to the Mississippi Sound and Mobile Bay. The Bayou La Batre fleet is almost evenly divided between gulf and bay boats while the transient fleet is exclusively gulf boats. Table VII shows the distribution of the resident fleet at Bayou La Batre.

TABLE VII
DISTRIBUTION OF BAYOU LA BATRE RESIDENT FLEET
BY LOADED DRAFT

Loaded Draft	Number of Vessels
2' - 3'	186
4' - 7'	50
8' - 10'	135
11' - 14'	132
15' - 16'	1
TOTAL	504

Precise distribution of the transient fleet is not available; however, it is known that most of these vessels draft less than 10 feet while nine of the transient boats present in 1986 had a loaded draft of 14 feet.

The operational characteristics of the Bayou La Batre commercial fishing fleet are consistent from year to year. From January through mid-May, the bay boats are virtually idle while the gulf boats are equally distributed off the coasts of west Florida and Texas. The warmer waters in those regions account for an earlier shrimping season than occurs along the central gulf coast. By mid-May, the brown shrimping season opens in the nearshore waters of Louisiana and, along with the continued shrimping along the Texas coast, attracts the Bayou La Batre resident gulf fleet. Although some vessels may bring their catch back to Bayou La Batre during this time, the majority land at nearby ports in Louisiana and Texas to offload and continue shrimping. Since many of these vessels are owned by seafood processors, much of the shrimp landed by the Bayou La Batre fleet at other ports is trucked back to Bayou La Batre.

By June, the brown shrimping season opens along the Mississippi and Alabama coasts. This activates the bay fleet and also brings some of the gulf boats back to the area. During July

Commercial Fishing Fleet, Bayou La Batre.

through September, the brown shrimping activity reaches its peak along the central gulf coast and during that time both the gulf and bay fleets as well as transient vessels are at work within Mississippi Sound and other coastal waters off Louisiana, Mississippi and Alabama. It is during this time that the commercial fishing and seafood processing activity is greatest at Bayou La Batre.

By October, the brown shrimping activity has subsided and the white shrimping season opens along the entire gulf coast. The gulf fleet returns to the more productive waters off the Texas-Louisiana coasts and continues to harvest the white shrimp through December. The bay boats continue their white shrimping activity in the Bayou La Batre area until January, at which time they again become inactive until the start of the next brown shrimp season.

The geographical distribution of the 1985 and 1986 total shrimp catch by the Bayou La Batre fleet was: 66% west of Bayou La Batre in Mississippi-Louisiana-Texas waters; 29% due south of Bayou La Batre either in Mississippi Sound or the open gulf, and includes those from Mobile Bay; and 5% east of Bayou La Batre in Florida waters. These percentages would not change by any significant magnitude from year to year under normal circumstances and illustrate the fact that the majority of shrimping occurs west of the study area.

c. Seafood Processing. A total of 57 seafood processing plants operate in Bayou La Batre, processing in excess of $100 million worth of seafood annually. During 1986, 42.5 million pounds of shrimp and 11.6 million pounds of other seafood products were processed by the plants at Bayou La Batre. The shrimp processed at Bayou La Batre come from three general sources: 1) landings at Bayou La Batre, 2) shrimp owned by the processor but offloaded at other ports and trucked, 3) shrimp purchased by the processor from other ports and trucked.

The existing seafood processing plants at Bayou La Batre are currently operating at about 50 percent full capacity. That is not to say that seafood processing is over-developed in the area, but that additional seafood could be processed with the existing infrastructure through additional employment, work shifts, etc.

2. Shipbuilding. A total of 17 shipbuilding and boat repair industries are situated along or near the bayou. Twelve are located adjacent to the existing Federal channel while two are located along the bayou above the Highway 188 bridge and two along Snake Bayou, a major tributary of Bayou La Batre. These industries provide annual employment for between 700 and 1000 persons[45]. In terms of total employment, shipbuilding and

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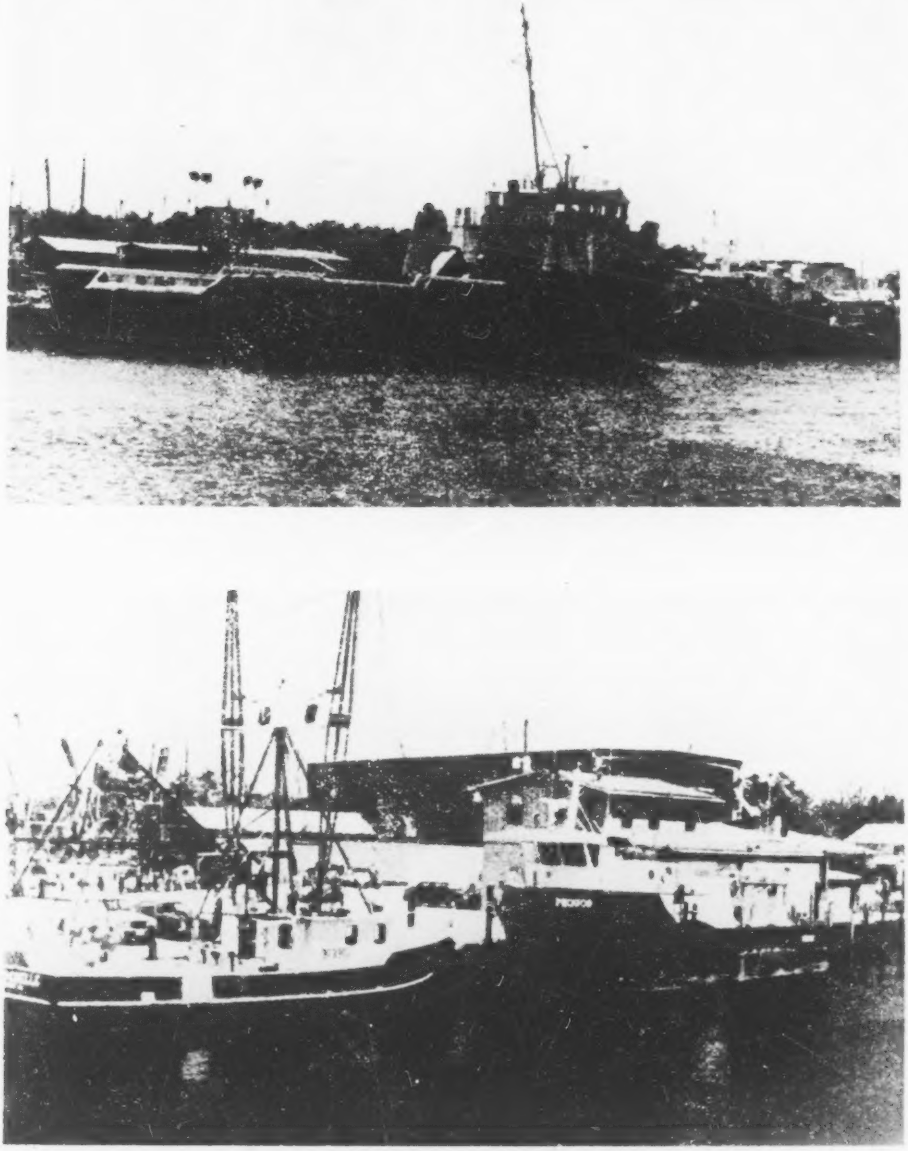
[45] 1987-1988 Alabama Directory of Mining and Manufacturing, Op. cit.



Oil Supply Vessels, Constructed and Serviced at Bayou La Batre.

repair is second only to seafood processing in Bayou La Batre.

The 17 shipbuilding enterprises constructed approximately 1100 vessels for domestic use from 1975 through 1986 and approximately 250 vessels for foreign interests during the same period. Most of the foreign vessels were constructed since 1982. Presently, about 150 vessels are constructed each year in Bayou La Batre bringing a total sales value of over $90 million annually. Over 1000 vessels are repaired and/or outfitted each year at a value of $4 million.

The major vessels constructed and repaired by the shipyards at Bayou La Batre are typically steel hull vessels and range from shrimp trawlers (70'- 100' length x 24'- 26' beam x 12' draft) to large research and supply vessels reaching dimensions of 192' length x 40' beam x 12' draft. Many of these larger vessels will ultimately draft over 12 feet after being outfitted in other deeper harbors. Other vessels constructed, converted or repaired at Bayou La Batre consist of small tankers, tugs, crew boats, push boats, U. S. Coast Guard vessels and barges.

F. Existing Channel Operations. This section of the report describes the existing Federal channel operations at Bayou La Batre. These descriptions include how the users - commercial fishermen and shipbuilders - currently operate under the constraints of the existing channel, the costs to the users due to these constraints and how the existing project is currently maintained. A more detailed discussion of the operating characteristics and costs associated with commercial fishing and shipbuilding is contained in Appendix B, Economic Analysis, to this report.

The existing Federal channel extends from the 12-foot depth contour in Mississippi Sound into Bayou La Batre to the Highway 188 bridge (Sta. 0+00). Note that from this point in the report, stationing will be used to describe the various channel segments of the project. Stationing begins at the Highway 188 bridge, 0+00 and progresses downstream and into Mississippi Sound with the mouth of the bayou at 130+00. The existing channel is maintained to a depth of 12 feet MLW by the Mobile District, U.S. Army Corps of Engineers. The channel bottom width is 100 feet within Mississippi Sound to a turning basin (30+00), which is located downstream of the Highway 188 bridge and is maintained by the local interests. From the turning basin to the bridge, the channel bottom width is 75 feet. Refer to Figure 2.

For the the purpose of describing the existing channel operations and conditions, the bayou channel segment referred to in this report is that part of the existing Federal channel from the Highway 188 bridge (0+00) to the mouth of the bayou (130+00) and also includes that part of Bayou La Batre outside the Federal project reaching approximately 1,500 feet above the bridge to Sta. -15+55. The Snake Bayou channel segment originates at the turning basin (30+00) on Bayou La Batre and extends approximately 1,350 feet into Snake Bayou to Sta. -13+55.

1. Channel Operations of Commercial Fishermen. Both the resident and transient commercial fishing fleet utilize the Bayou La Batre channel for access to obtain fuel and supplies and to offload their catch at the numerous seafood processing establishments along the bayou. There are no set or distinctive patterns in terms of certain vessels utilizing only certain portions of the channel. All commercial fishing vessels from time to time utilize all portions of the bayou channel. Commercial fishermen purchase fuel and supplies from the establishment offering the best prices, and these fuel and supply dealers are located all along the bayou. Likewise, except for those vessels owned and operated by certain seafood processors, the vessel operators offload their catch at the processing plant purchasing at the higher price. The sale of fuel and supplies as well as the purchase of seafood is highly competitive among the enterprises at Bayou La Batre.

All commercial fishing vessels utilizing the project experience constraints due to the existing width of the Bayou La Batre and Snake Bayou channel segments. Operational inefficiencies occur due to the requirement for vessels to operate at no-wake speeds in those segments. Some maneuverability difficulties are also encountered by the larger vessels. The operating speed requirements attributable to restricted width in the bayou is primarily due to the close proximity of existing bulkheads, piers and docked vessels in these reaches and not necessarily to the existing bottom widths of the Federal channel to the Highway 188 bridge or the natural channels above the bridge and into Snake Bayou.

Any proposed improvements to eliminate constraints due to channel width were qualitatively excluded from further consideration early in the study. This was due to the tremendous impacts and costs associated with infrastructure relocations which would be necessary to widen the channel within the bayou, thus rendering the project economically infeasible.

Vessels with loaded drafts of 10 feet or less can operate on the channel with few difficulties associated with channel depth and are excluded from further analysis. Vessels with loaded drafts of 10 feet or more experience some delays and damages attributable to channel depth under certain conditions. Based upon field data, there are approximately 142 annually operating commercial fishing vessels within this category - 133 resident and 9 transient vessels. The distribution of these vessels by loaded draft is shown in Table VIII.

Commercial Fishing Vessels in Snake Bayou.

Low Water Levels Within Bayou La Batre.

TABLE VIII
DISTRIBUTION OF COMMERCIAL FISHING VESSELS BY LOADED DRAFTS EXCEEDING 10 FEET

Loaded Draft	Number of Vessels
11 ft.	24
12 ft.	101
13 ft.	4
14 ft.	12
16 ft.	1
TOTAL	142

Delays and damages experienced by the loaded commercial fishing vessels normally occur upon return to port. The deeper-draft vessels require the existence of above mean to high astronomical tide stages in order to traverse the channel and move into port to unload the catch. Therefore, due to the diurnal (one high and one low per day) tide along the gulf coast, the deeper-draft vessels have few opportunities to safely and efficiently enter the bayou with their catch. This situation results in significant time delay costs and lost opportunity for earnings for the boat operators and crew, even under optimum conditions. This condition is further aggravated during certain periods of the fall and winter months when strong northerly winds associated with occasional frontal passages may prevent tides from reaching normal high levels. At times, some operators will risk maneuvering into port under less than optimum tide or light levels. Such risk taking accounts for the majority of vessel damages experienced by the commercial fishing fleet.

Commercial fishing vessel operators traveling from Bayou La Batre south into the open gulf prefer to use Petit Bois Island Pass, a natural tidal pass just off the western tip of Dauphin Island. It is perceived that this route offers shorter, more direct access to shrimping and fishing areas south of Bayou La Batre. However, a shifting channel due to rapid shoaling coupled with strong winds and currents in the area create unsafe conditions through the pass the majority of the time, especially for the deeper draft vessels. Based upon information furnished by vessel operators, Petit Bois Pass is not usable 70 percent of the time. In the absence of a safe passage through Petit Bois Pass, vessels must transit the Gulf Intracoastal Waterway (GIWW) and enter the gulf along either the Pascagoula or Mobile ship channels, depending upon the direction of travel. The vessel operators estimate that this travel adds three additional hours' time and associated cost per trip.

In the spring of 1986, a test effort for the harvest of butterfish (Peprilus burti) was conducted in the Gulf of Mexico.

Butterfish has virtually no demand in the U. S. market but is a delicacy bringing high prices in Japan. In order for this product to meet the quality standards of the Japanese consumer, the butterfish must be frozen quickly after being caught. This is accomplished through the use of large freezer-processor vessels. Deep Sea Foods, Inc. of Bayou La Batre, with the use of three large converted shrimp trawlers, participated in the test. Since these vessels' loaded draft were to 14 feet, their catch was carried to the deeper port of Pascagoula, Mississippi, offloaded and trucked to Bayou La Batre for additional processing and packaging. A total of 96,000 pounds of butterfish was trucked to Bayou La Batre. The additional labor, wharfage and trucking costs were $0.12 per pound or a total of $11,500.

Table IX summarizes the costs to the commercial fishing fleet at Bayou La Batre attributable to the depth of the existing Federal channel and the condition of Petit Bois Pass.

TABLE IX
ANNUAL COSTS FOR COMMERCIAL FISHING FLEET OPERATIONS
EXISTING CONDITIONS

Categories	Existing Costs
Vessel Delays	$119,200
Opportunity Costs	175,400
Vessel Damages	420,300
Diver Expenses	46,200
Additional Travel Time	76,900
Butterfish Operations	11,500
TOTAL	$849,500

2. Channel Operations of Shipbuilding and Repair Industries. Each vessel constructed at Bayou La Batre is launched, given a minimum of two sea trials and then delivered. This requires that each vessel transit the channel at least five times - two round trips for sea trials and one trip for delivery. Those vessels with 10 feet or less draft have little trouble negotiating the existing channel at any time. However, those vessels with deeper drafts must wait for tides above mean or, in some cases, high tide before they can be launched, sea trialed or delivered. In some cases, this means that crews must be available for launches during the nighttime hours adding to the labor costs associated with the construction of the vessel.

For the very large research and supply vessels, a split operation is normally conducted. Due to the channel depth limitations, the hull is constructed within the bayou and is towed to a deeper harbor where engines and other equipment is installed to complete the construction. Many of these size vessels will ultimately draft as much as 15 feet. Significant labor and travel costs are incurred by the shipbuilder in constructing vessels in this manner.

Table X contains the costs attributable to damages, delays and split operations for the shipbuilding industry at Bayou La Batre.

TABLE X
SUMMARY OF ANNUAL COSTS TO SHIPBUILDERS
EXISTING CONDITIONS

Damages	$ 469,700
Delays	340,000
Split Operations	905,800
TOTAL	$2,215,500

3. Existing Channel Maintenance. Maintenance dredging of the existing Bayou La Batre project is conducted by the Mobile District, U. S. Army Corps of Engineers on a three-year cycle. Normally, a 20-inch hydraulic cutterhead dredge is used for the maintenance dredging. The disposal of this material is split between open water within Mississippi Sound and an existing upland disposal site, "Charlie". Other upland sites have been used for maintenance dredged material disposal over the years, primarily upland sites "Alpha" and "Beta", which are located on the west side of the bayou at the mouth. The City of Bayou La Batre provides the upland disposal area, diking and rights-of-way for the project. Figure 14 contains the location of the existing upland disposal site "Charlie" at Bayou La Batre.

Typically, the quantity of maintenance dredged material averages 400,000 cubic yards (C.Y.) per each three-year cycle, of which 100,000 C.Y. are deposited into the upland site and 300,000 C.Y. are deposited into open water adjacent to the channel in Mississippi Sound. The average cost per three-year dredging cycle under the existing condition at Bayou La Batre is $445,000, including upland disposal area site preparation and diking costs.

4. Maintenance Dredging of Berthing and Launching Areas. The maintenance dredging of berthing and launching areas or pits is the responsibility of the City of Bayou La Batre or the individual users along the channel. The City of Bayou La Batre maintains the basin in the area of the city docks, shown on Figure 12, while each channel user maintains their respective berthing or launching area. This maintenance is normally conducted by dragline. The material is piled on an approved site to dry and is then used for fill material or is trucked to other areas for disposal. The existing upland disposal area "Charlie" is used only for the Federal dredging.

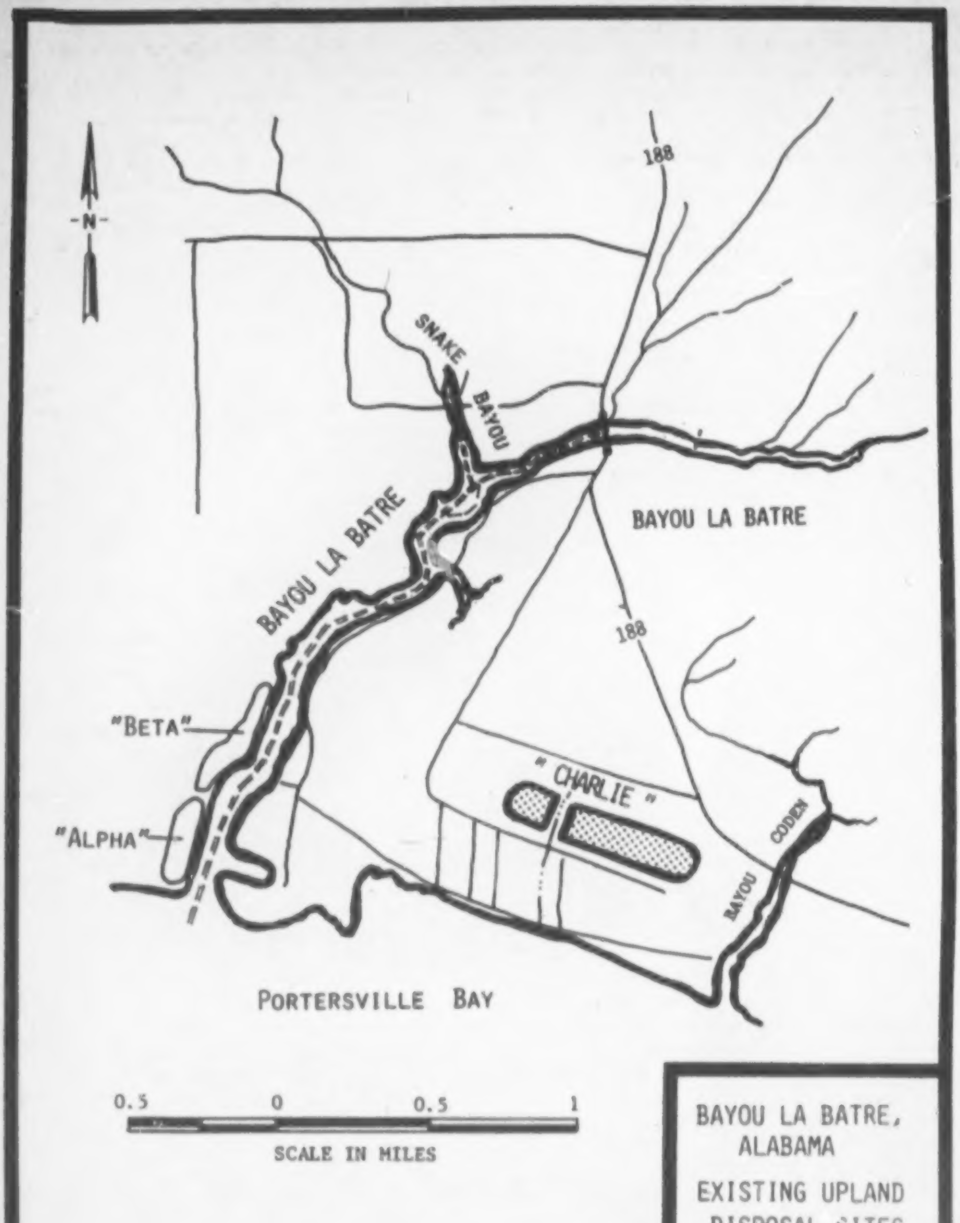

N
188
SNAKE BAYOU
BAYOU LA BATRE
BAYOU LA BATRE
188
"BETA"
"ALPHA"
" CHARLIE "
BAYOU CODEN
PORTERSVILLE BAY
0.5
0
0.5
1
SCALE IN MILES
BAYOU LA BATRE, ALABAMA
EXISTING UPLAND DISPOSAL SITES

FIGURE 14

III. FUTURE WITHOUT PROJECT CONDITION.

A. General. This section of the report describes the future without project condition which could reasonably be expected to occur without an improved navigation channel at Bayou La Batre and discusses the problems, needs and opportunities associated with the Federal channel. The future without project condition focuses on the projected economic activity associated with commercial fishing and shipbuilding and the expected future environmental conditions. The analysis and determination of the future without project condition is the basis for the calculation of economic benefits for the project and for the formulation of alternative plans. The period of analysis is 50 years, 1991 - 2040, which represents the project life of an improved channel at Bayou La Batre.

B. Economic Activity.

1. Commercial Fishing. The determination of the future without project condition for Bayou La Batre commercial fishing activities centers on the outlook for future demand and supply of traditional seafood products; prospects for the establishment of the butterfish industry at the project; change in the size of the commercial fishing fleet at Bayou La Batre; and future vessel characteristics and operational patterns.

a. Future Seafood Demand. It is expected that the demand for seafood products will continue to increase into the future and that the demand will continue to exceed that which the U. S. commercial fleet can supply. The demand for fish and shellfish in the U. S. has grown 30% since 1960[46] and only 41% of the seafood products consumed in this country are supplied by U. S. fishermen[47]. The increase in demand for seafood products has been because of greater dietary awareness and advancing fishing technology in the U. S. improving the quantity and quality of the product.

b. Future Seafood Supply. There are two primary aspects to the determination of future seafood supply: 1) the impacts to the Gulf of Mexico shrimp resource expected from a projected 30% loss of Louisiana marsh and 2) the capability of the commercial fishing fleet and seafood processing industry at Bayou La Batre to supply these products.

A number of studies and reports exist that address and attempt to quantify and project the impacts of the loss of Louisiana marsh to the shrimp and other fishery resources in the Gulf of Mexico. The primary causes for the loss of marsh along the Louisiana coastline have been identified as: 1) rapid subsidence due in part from oil production activity in the region, 2) depleted sediment deposits from the Mississippi River due to levee construction, and 3) saltwater intrusion into the marsh via sea level rise and an extensive network of canals constructed over the past 20 to 30 years.

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[46] Fisheries of the United States, 1985, Op. cit.

[47] Loc. cit., p. 77

The importance of wetlands to the maintenance of estuarine dependent fisheries is well established (Herke, 1971; White and Boudreaux, 1977; Rogers, 1979; Simoneaux, 1979; More, 1969; Conner and Truesdale, 1973; Chambers, 1980; Zimmerman et. al., 1987; Minello et. al., 1987) and there is growing evidence that the amount of wetland is the most important factor influencing the fishery production. Turner (1979) indicated that the commercial inshore shrimp fishery was directly proportional to the area of intertidal vegetation in Louisiana. Turner and Brody (1983) indicated that the percentage of brown shrimp caught is a function of the percent of emergent brackish and saltwater marsh plant cover while white shrimp catch is a function of freshwater vegetation. Barrett and Gillespie (1973) reported a correlation between the acres of nursery grounds available during April and May and brown shrimp production. For an area to be suitable as nursery ground for shrimp, it must contain intertidal vegetation and have a salinity range above 10 ppt.

The Gulf of Mexico Fisheries management Council (GOMFMC) Management Plan for the Shrimp Fishery of the Gulf of Mexico, United States Waters (1981) discusses a number of problems associated with both assessing the current status of stock and estimating future stock conditions. These problems are a result of significant data deficiencies as well as the biology of the species. Data deficiencies include a lack of understanding of mortality rates, temperature and salinity effects on growth rates, and of migration patterns; lack of data on utilization of the shrimp resources; and lack of cost-earnings and catch-effort data. Biological factors include the lack of a demonstrable stock recruitment relation, and the fact that shrimp are an annual crop where very few live longer than one year. In fact, most are harvested before they are six months old. The management plan indicates that none of the shrimp species in the Gulf of Mexico appear biologically overfished. This is due in part to the inability of the industry, given present technology, for recruitment overfishing. Growth overfishing, i.e. over harvesting small shrimp, is possible; however, the management plan precludes this possibility. The management plan does indicate a major concern for future stock related to adequate habitat. This concern includes not only land loss and habitat alteration, but also freshwater reduction, pollution, and sea level rise.

Most management plans are based upon the sustainable yield of a species. Sustainable yield is defined as the yield in weight taken from a stock when the stock is in equilibrium with a given intensity of fishing and stock biomass is not changing from year to year. Sustainable yield is most appropriately applied to stocks with multiple year classes. Because of the unusual biological characteristics of shrimp, fishing mortality and yield in one year do not affect yield in the following year. The maximum yield in number for a given year is essentially all the shrimp available to harvest, using current technology. The abundance of shrimp and therefore the yield and catch per unit effort, vary greatly from year to year depending upon environmental factors. A surplus production model was utilized in the GOMFMC management plan to estimate the maximum sustainable yield. Maximum sustainable yield is the largest average catch (yield) that can continuously be taken from a stock under existing environmental conditions. These models indicate only a long term average yield, and not an allowable maximum The yield (catch) in any given year can only be estimated using the environmental factors and expected effort for a particular year. Utilizing historical data relative to environmental factors, effort , and catch for Louisiana; a maximum probable yield or catch of brown shrimp was determined which was approximately 137.6% greater than the surplus production model value. Applying this percentage to the other two dominant species - white and pink shrimp - an estimate of 188 million pounds of tails was determined to be the maximum probable catch of the three species for the Gulf of Mexico. This estimate equates to approximately 306 million pounds heads on annually.

Optimum yield of shrimp, while preventing overfishing, is the goal of the GOMFMC plan. Optimum yield is defined as the amount of fish:

a. which will provide the greatest overall benefit to the nation, with particular reference to food production and recreational opportunities; and

b. which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social, or ecological factor.

The council determined that, because of the annual nature of the resource, a numerical value for optimum yield cannot be calculated for any given year until the environmental factors can be determined and evaluated. However, under optimum environmental conditions and maximum effort on the part of commercial fishermen, the maximum probable catch is estimated to be 306 million pounds heads on. The Council also indicated that fishing would not be stopped when this numerical value was reached. The Council will monitor environmental conditions and, if warranted, a new maximum sustainable yield/optimum yield would be established. As of now, no change to the previous estimates has been made.

The National Marine Fisheries Service, Galveston Laboratory, provides monitoring data to the GOMFMC relative to environmental conditions in the gulf. The laboratory indicates that while trends in marsh loss in Louisiana are increasing, the recruitment of shrimp is also increasing. This may in part be explained by the fact that much of the wetland that is currently being lost is not of value as nursery area for shrimp and, therefore, the abundance of suitable habitat is remaining the same or even increasing. It is their belief that these increases cannot continue and that, at best, the shrimp resources in the future will be maintained at present levels. Shrimp landings data for the period 1980 to 1986 at Louisiana ports have shown dramatic increases from 103 million to 166 million pounds, however during this same period the fishing effort has also increased dramatically. The estimates presented in the GOMFMC are generally regarded as the most reliable upon which to base future supply projections. It is these estimates that form the basis for projections of future conditions within this report.

The quantity of shrimp landed at Bayou La Batre has, over the past 25 years, grown steadily and consistently with those increases indicated for the entire Gulf of Mexico. This trend indicates that the port of Bayou La Batre has maintained its market share of shrimp landings through the period. It is reasonable to expect that for the future without project condition, Bayou La Batre will continue to maintain the current market share of shrimp landings among other competing ports within the Gulf of Mexico. Based upon past trends in shrimp landings and considering the projections for maximum sustainable yield in the gulf, landings at Bayou La Batre will continue to increase into the future at an average annual growth rate of 1.91% to the year 2001, at which time the currently projected maximum sustainable yield would be met. At that rate, shrimp landings at Bayou La Batre in the year 2001 would total 19.6 million pounds while 37.8 million pounds would be trucked, for a total of 57.4 million pounds of shrimp to be processed. The estimated capacity of the existing seafood processing plants at Bayou La Batre is approximately 85 million pounds per year.

c. Future Bayou La Batre Commercial Fleet Characteristics. The size vessels composing the commercial fishing fleet at Bayou La Batre has been increasing at a faster rate than the remainder of the Gulf of Mexico fleet. The Bayou La Batre fleet increased from 56 net tons to 73 net tons per vessel during the period 1970 - 1980 while the Gulf of Mexico fleet averaged an increase of from 55 to 60 net tons per vessel over the same period. Field data collected for this study revealed that seven large vessels in excess of 100 net tons each were added to the Bayou La Batre fleet during the summer of 1987. These vessels have loaded drafts of 12 to 14 feet.

The total number of vessels in the Bayou La Batre fleet grew from 369 vessels in 1970 to 534 in 1980, but had decreased to 504 vessels in 1986. There seems to be a developing trend toward larger vessels in the fleet. The necessity for the Bayou La Batre fleet to travel long distances and preserve their catches for longer periods of time account for this trend. It is expected that the future without project condition will be a stable fleet size in terms of numbers of vessels but that the size vessels composing the fleet will increase.

A trend toward larger vessels will lead to an increase in operational costs for the commercial fleet. These costs are expected to increase at the same annual growth rate, 1.91%, for increases in landings or activity at the port up to the year 2001 when the maximum sustainable yield is reached and activity levels. This growth in commercial fishing vessel operational costs is based on the premise that the increasingly larger vessels will experience greater amounts of delay time and damages due to the restrictions of the existing 12-foot deep channel.

It is expected that the butterfish industry will become a growth industry on the gulf coast based upon research conducted by the NMFS Research Lab at Pascagoula, Mississippi. A total of 20 freezer-processor stern trawlers are projected to be operating in the gulf in future years and that three of these vessels' production would be processed at Bayou La Batre. The total annual catch of butterfish, 9,606,000 pounds, from these three vessels would be trucked to Bayou La Batre from Pascagoula, Mississippi, which is the nearest deep water port. Under the future without project condition, these large vessels would not be expected to land at Bayou La Batre. The average annual cost of, handling, storing and trucking butterfish to Bayou La Batre at $0.13 per pound would total $1,248,800.

Table XI summarizes the projected future without project average annual equivalent operational costs for commercial fishing activity at Bayou La Batre. See Appendix B, Economic Analysis for additional detail.

TABLE XI
AVERAGE ANNUAL EQUIVALENT OPERATIONAL COSTS
COMMERCIAL FISHING FLEET
FUTURE WITHOUT PROJECT CONDITION

Category	Costs
Vessel Delays	$151,300
Opportunity Costs	222,700
Vessel Damages	533,600
Diver Expenses	58,600
Additional Running Time, Petit Bois Pass	97,600
SUBTOTAL	$1,063,900
Butterfish, Handling Costs	$1,248,800
TOTAL	$2,312,700

2. Shipbuilding. The shipbuilding industry is expected to continue to grow into the future. Based upon increased world and U. S. demand for seafood products, the fishing technology will improve to meet this demand. Changes in fishing technology will bring about changes in the characteristics of vessels required for commercial fishing. Evidence of this is presently emerging in the form of the increasing use of large freezer-processor stern trawlers in the Gulf of Mexico fleet. The shipbuilders at Bayou La Batre, however, are not limited to the fishing technology within the Gulf of Mexico but are increasingly supplying vessels to foreign countries. In 1986, 36 vessels were constructed and delivered to foreign interests by four of the shipbuilders in Bayou La Batre. A number of these vessels were large semi-freezer processors, or trawlers with larger freezer space and processing capabilities.

The skill and efficiency of the shipbuilding industry at Bayou La Batre will also lead to continued increases in construction activity. The shipyards utilize multi-skilled, nonunion craftsmen which cross skill lines and, on the average, construct vessels 20% faster and 30% cheaper than competitive yards. Many of the shipbuilders are also owners of commercial fishing vessels or companies and, therefore, maintain continued hands-on experience in growing fishing technology and the needs of the commercial fleet.

The increase in shipbuilding activity along the main Bayou La Batre channel as well as within Snake Bayou and above the Highway 188 bridge plus the building of larger vessels in the future will mean more time delays and damages during sea trials and deliveries under the without project condition. The very large vessels will continue to be constructed under a split operation. It is projected that the operational costs attributable to the existing channel depth at Bayou La Batre will increase at an annual growth rate of 1.4% over the 50-year life of the project. These average annual costs total $1,673,600 for the Bayou La Batre channel below the turning basin. Additional average annual operational costs expected within Snake Bayou and above the turning basin are $365,100 and $574,800, respectively.

C. Future Without Project Environmental Conditions.

Prior to the late 1960's, wetlands were filled indiscriminately for the purpose of residential, industrial, and commercial development. With the implementation of the National Environmental Policy Act in 1970 and amendments to the Federal Water Pollution Control Act in 1972 (Clean Water Act), the indiscriminate dredging and filling of wetlands has been curtailed. In addition, passage of the Coastal Zone Management Act encouraged the state governments to implement land use plans for coastal areas; the State of Alabama's Coastal Area Management Program was approved in 1979 and the State of Mississippi's Coastal Zone Management Program was approved in 1980. Although these laws exist, some wetlands may be converted to other uses in the future, especially in the case of water dependent industries. These and other laws, however, provide for the consideration of mitigation of these impacts; therefore, the acreage of wetlands filled in the future would more than likely be balanced or compensated through mitigation in order to minimize impacts and maintain the productivity of the system. Areas which are likely to be considered for future development are shown on Figure 10. In most instances this development pressure will occur with or without the project since suitable areas for additional water dependent activities at Bayou La Batre are in short supply.

The fishery resources within the Bayou La Batre area are highly variable and because they are gathered from throughout the Gulf of Mexico, they are dependent upon the environmental state of the entire area of Mississippi Sound and the nearshore Gulf of Mexico and the land areas adjacent to these waters, including the States of Texas, Louisiana, Mississippi, Alabama, and Florida, as well as Mexico. Fishery landings and values fluctuate in response to weather, fishing pressure, and the economic environment of the fishing industry, including the cost of fuel, number of vessels, and the value of catch.

A fishery resource within the Gulf of Mexico which has come under tremendous pressure is the red drum (Sciaenops ocellatus), which is a popular sport and commercial marine species. Red drum spawn in the waters along the gulf side of the barrier islands, usually in or near the passes in fall and winter. Most of the planktonic larvae and early juveniles are carried by the currents into the shallow areas of the sounds and bays. Young red drum tend to seek out sheltered coves and lagoons where they occupy shallow waters along the marsh edge. Most red drum remain in these areas for the summer and migrate, at night, into the Gulf of Mexico during the late fall. Migratory movements are primarily inshore-offshore and after the first spawning, red drum spend increasingly more time in the gulf than in the estuaries. Most males mature at ages 1 or 2 while the females do not begin maturation until age 3[48].

In January 1984, the Gulf of Mexico Fishery Management Council (GOMFMC) in cooperation with the Gulf States Marine Fisheries Commission, prepared and published a "Fishery profile for Red Drum". At that time, the GOMFMC concluded that the preparation of a plan and regulation of the red drum fishery in the exclusive economic zone (EEZ) of the Gulf of Mexico were not appropriate. This situation has changed drastically with the increasing popularity of ethnic foods, in this instance cajun food, and in particular 'Blackened Redfish'. The increasing consumer demand resulted in the evolution of a major red drum fishery in the EEZ. Concerns over the long term damage that would occur to red drum stocks from this new fishery resulted in the preparation of a fishery management plan for red drum in the Gulf of Mexico. This management plan identified a number of problems in the fishery including: increased harvest of spawning stock in the EEZ, growth overfishing in nearshore waters, shift in harvesting patterns towards commercial efforts in unexploited waters, wasteful harvesting practices, habitat reduction and degradation, and incompatible state/Federal programs.

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[48] Murphy and Taylor, 1986.

Historically, the bulk of landings came from the west coast of Florida and from Texas. Louisiana landings, though fluctuating from year to year, have gradually increased. Alabama landings seldom reached 100,000 pounds until 1983, but in 1985, Alabama landings were 2.8 million pounds, second only to Louisiana. About 80 percent of the total commercial catch of the Gulf of Mexico from 1968 to 1985 was taken from estuarine areas. The proportion of the catch from oceanic areas varied among states from an average of 41 percent off the west coast of Florida to five percent off the Texas coast. A relatively high proportion of the Alabama/Mississippi catch is from oceanic waters, averaging about 56 percent. The fishery is most active during the final and first quarter of each year (October through March), when 64 percent of the catch is taken. The period of reduced catches in the northern Gulf of Mexico corresponds to the shrimp season; both directed effort for red drum and retention of the red drum incidental catch of shrimp vessels may be lowered during this time because so much attention is given to shrimp[49].

Future recruitment into the inshore fishery is largely unpredictable; however, if the adult spawning biomass is low, then the risk of a subsequent decline in inshore recruitment increases. To reduce this risk, the fishery management plan suggests that equilibrium spawning stock biomass not be reduced below 20-40 percent of the levels that existed before exploitation, prior to 1984. Even though the present inshore production is less than maximum sustainable yield, maximum sustainable production will not be reached given the high level of inshore exploitation rates. In addition, limited evidence suggests that the survival to the offshore spawning stock may be decreasing. As a result, Alabama closed its waters to commercial fishing for red drum in 1986. The sale of red drum caught in Texas waters had been prohibited since May 1981[50]. The states of Louisiana, Mississippi and Florida are currently preparing management plans to address the issue of overharvest. Due to increasing concerns over the health of the offshore spawning stock, NOAA issued an emergency rule to close the EEZ of the Gulf of Mexico to the harvest until March 30, 1988 and has subsequently extended the closure for an additional 90 days.

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[49] Gulf of Mexico Fishery Management Council, 1986.

[50] Ibid.

NOAA, via the Gulf of Mexico Fishery Management Council, has proposed to amend the 1986 plan to permanently close the EEZ to red drum harvest. These problems will more than likely continue to occur as long as the consumer demand continues for red drum with or without the Bayou La Batre project.

The wildlife resources utilizing the upland portion of the study area would continue in the existing trend unless demands for development spread into this part of Mobile County. Wildlife utilizing the wetlands and barrier islands will continue to flourish due to the regulation of activities in these areas through Section 404 of the Clean Water Act and the Coastal Barrier Resources Act (western end of Dauphin Island) and the protected status of Horn and Petit Bois Islands as part of the Gulf Islands National Seashore. It is also expected that the current trends in endangered and threatened species would continue without the Federal project.

Without the Federal project, the water and sediment quality within the Bayou La Batre area would tend to remain the same in some areas and improve in others. The passage of the amendments to the Federal Water Pollution Control Act in 1972 instituted the National Pollution Discharge Elimination System (NPDES) under which discharge permits are granted by the state with Environmental Protection Agency approved programs. Any discharges by point sources, except in compliance with the limitations imposed in a permit, are declared unlawful. The State of Alabama operates under this system. The upgrading of the sewage treatment facility and construction of the outfall lines for the washwater from the seafood processing houses will also help to improve the quality of water in the area. The provision of additional facilities in the future, with the ultimate aim of reducing the number of individual septic systems within the area, would also help to reduce the fecal coliform levels which currently restrict water use classification in the area.

Open water disposal of dredged materials within sites in Mississippi sound, as is practiced with the currently authorized Federal project for Bayou La Batre, will continue to result in localized increased turbidity and nutrients and decreases in dissolved oxygen within the water column. Return water from the existing upland disposal site "Charlie" would also continue to cause temporary localized increases in turbidity and nutrients and decreases in dissolved oxygen within the immediate vicinity of the outfall. Short term localized effects of this nature would continue to occur at the dredge cutterhead during maintenance dredging operations.

The clay sediments which are present in the Bayou La Batre channel have a high affinity for heavy metal and organic contaminants, such as those resulting from navigation traffic and the shipbuilding industry. As such, the sediments within the channel serve as a sink for these materials. This process would continue to occur without the Federal project unless discharge of these materials were curtailed. Maintenance dredging of the currently authorized project would continue to redistribute these materials to other areas adjacent to the channel during open water disposal.

The barrier islands of the study area; Dauphin, Horn and Petit Bois; are in natural erosion/deposition cycle which results in the westward migration of each island. Without the project, this would continue to occur with Dauphin and Horn Islands elongating westward. Petit Bois, on the other hand, would continue to intrude into the Pascagoula Ship Channel on it's western end and erode on the eastern end.

The marshes of Point aux Pins/Isle aux Dames would continue to erode due to increased exposure to wave activity. This loss of wetland will probably continue without the Federal project unless measures are taken to protect these features or Petit Bois Pass shortens and migrates westward.

D. Problems, Needs and Opportunities.

1. Problems. The problems with the existing 12-foot channel at Bayou La Batre are depth related operational and production inefficiencies for the commercial fishing fleet, shipbuilding industry, and other marine related industries. The lack of channel width, due to the close proximity of existing infrastructure, compounds the navigational efficiency problems for the fleet.

The Bayou La Batre infrastructure is ideally suited to the commercial fishing and shipbuilding industries. There is, however, almost no land available along the bayou to accommodate new or induced commercial activity. Economic growth, therefore, is in the gradual shift to larger, more efficient, commercial fishing vessels in order for Bayou La Batre to maintain its current market share within the Gulf of Mexico. This trend in commercial fishing vessels will, likewise, be reflected in the size vessels constructed by the shipbuilding industry along the bayou.

Shoreline erosion is a common occurrence along the Alabama coastline, but the severity varies from location to location. The shoreline of Mississippi Sound, with its low-lying salt marshes and tidal creeks, erodes at an annual rate of from 3 to 7 feet. The barrier islands, due to direct exposure to wind, tide, and waves, experience a much greater erosion rate. Dauphin Island and Petit Bois Island are in a natural westward migration cycle with accretion on the west end. This process has resulted in a widening of Petit Bois Pass over the years increasing the erosion rates of Isle aux Herbes and other areas within Mississippi Sound.

The loss of marsh areas due to subsidence and sea level rise within the study area and especially along the Louisiana coastline is effecting the declining availability of habitat for shrimp and other commercially important species.

2. Needs. The needs of commercial enterprises at Bayou La Batre is a deeper and wider channel in order to maximize operational efficiency within the project. Diversification of the commercial fishing industry is occurring, as indicated by the emergence of the butterfish industry, which requires larger fishing vessels. The shipbuilding industry is also building larger vessels for both domestic and foreign interests.

There is a need to slow the process of shoreline and barrier island erosion as well as the loss of valuable marsh habitat in the region.

3. Opportunities. There are opportunities for the City of Bayou La Batre and the Federal government to expand and enhance local, state and national economic development through increased operational efficiency of the commercial fishing and shipbuilding industries at Bayou La Batre.

Opportunities from construction of an improved navigation project at Bayou La Batre exist for the use of desirable dredged material for island nourishment, shoreline stabilization, marsh creation and other beneficial uses.

IV. ENGINEERING ANALYSES.

A. General. The engineering analyses conducted for the study were: channel design, bulkhead/pier replacement analysis, utility relocations analysis, and dredging and dredged material disposal analysis. The approach, as well as the results of each analysis, are described within this section.

B. Channel Design. The channel design for the Bayou La Batre project was divided into six channel segments, and for three of the segments, a total of five navigation depths were investigated. The dimensions of each channel segment were determined based upon a particular design vessel; incorporated as much as possible the channel design standards contained in EM 1110-2-1615, Hydraulic Design of Small Boat Harbors; and considered the existing operational practices of vessel operators along the bayou. Channel widening was not incorporated into the channel design within the bayou due to the close proximity of and impacts to existing infrastructure.

The six channel segments for the project are:

Bayou Channel Segments. See Plates 1 thru 3.

- Lower Bayou Segment. From the mouth of the bayou (130+00) to and including the turning basin (30+00).

- Upper Bayou Segment. From the turning basin (30+00) to above the Highway 188 bridge (-15+10).

- Snake Bayou Segment. Into Snake Bayou from the turning basin (30+00), or 0+00 for Snake Bayou, to Sta. 13+47.

Mississippi Sound Channel Segments. See Figure 15.

- Sound Segment. From the mouth of Bayou La Batre (130+00) to an approximate intersection with the existing Gulf Intracoastal Waterway (GIWW) (536+00).

- Pass Segment. From the GIWW (536+00) south through Petit Bois Pass into the Gulf of Mexico.

- GIWW Segment. From Sta. 536+00 along the existing GIWW alignment and intersecting with the Pascagoula Ship Channel (1131+24).

The purpose in segmenting the Bayou La Batre channel was because of the various design vessels considered for the study and the operational characteristics of the commercial fishing fleet. The design vessels for each channel segment are shown in Table XII.

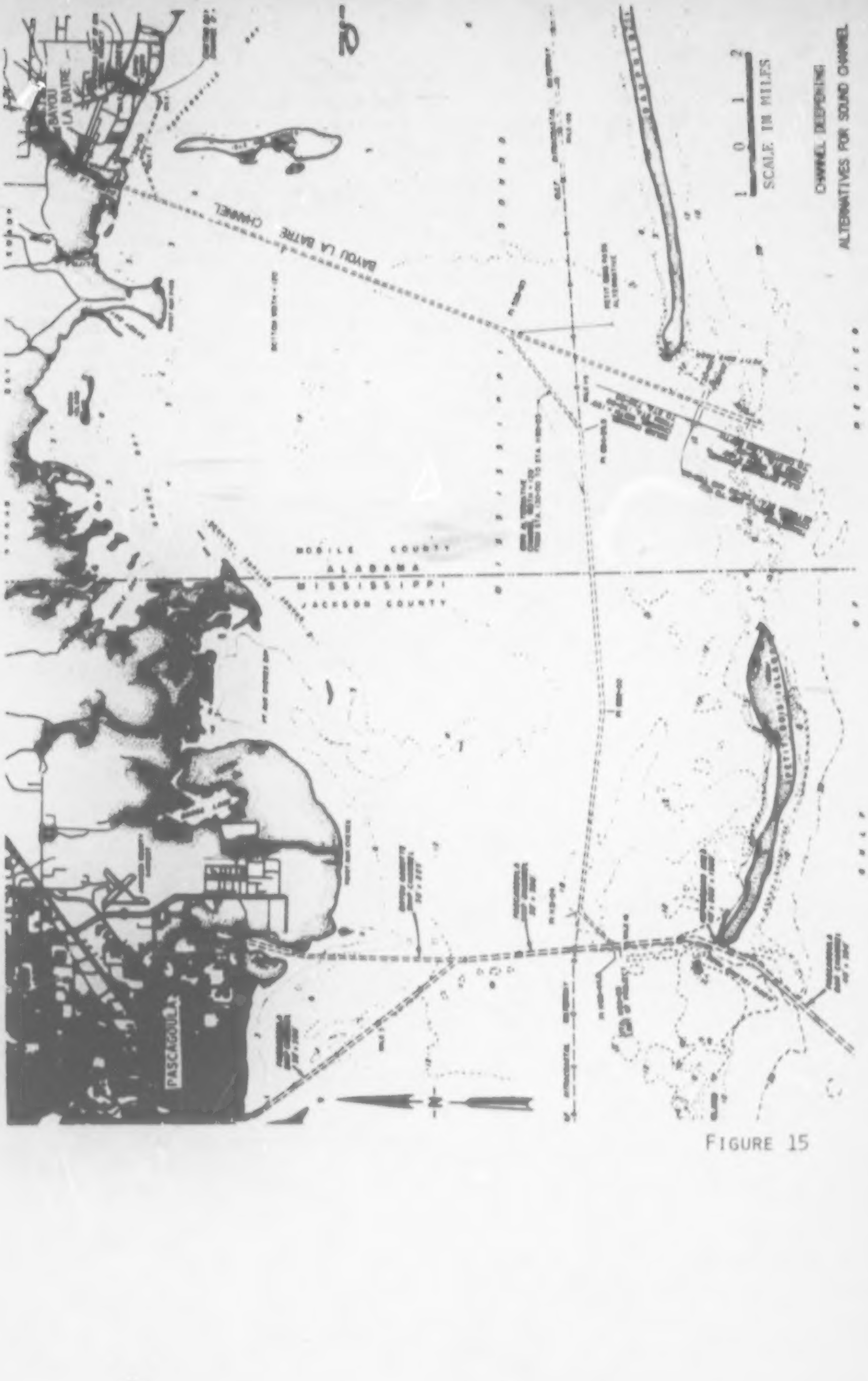

BAYOU LA BATRE
BAYOU LA BATRE CHANNEL
MOBILE COUNTY
ALABAMA
MISSISSIPPI
JACKSON COUNTY
PASCAGOULA
N
0 1 2
SCALE IN MILES
CHANNEL DEEPENING
ALTERNATIVES FOR SOUND CHANNEL

FIGURE 15

TABLE XII
DESIGN VESSELS

Channel Segment	Design Vessel
Lower Bayou Segment	192'long x 40'wide x 16'draft
Upper Bayou Segment	90'long x 26'wide x 12'draft
Snake Bayou Segment[1]	90'long x 24'wide x 12'draft 95'long x 26'wide x 10'draft
Mississippi Sound Channel Segments.	192'long x 40'wide x 16'draft

[1] The 12-foot draft vessel was used from Sta. 0+00 to Sta. 5+33. The 10-foot draft vessel was used from Sta. 5+33 to Sta. 13+47.

The design vessels selected for each channel segment are vessels which have or currently are utilizing the existing project. Based upon the design vessels, the dimensions of the respective channel segments are shown in Table XIII.

TABLE XIII
CHANNEL SEGMENT DIMENSIONS

Channel Segment	Bottom Width	Navigation Depth[1]
Lower Bayou	100 feet	14,16,18,20 & 22 ft.
Upper Bayou	75 feet	14 ft.
Snake Bayou	50 feet	12 ft. & 14 ft.[2]
Sound Segment	120 feet	14,16,18,20 & 22 ft.
GIWW Segment	120 feet	14,16,18,20 & 22 ft.
Pass Segment	150 feet	15,17,19,21 & 23 ft.[3]

[1] An additional 2 feet would be dredged below the navigation depth (1 ft. advance maintenance and 1 ft. overdepth).

[2] 14 feet to Sta. 5+33 and 12 feet to Sta. 13+47.

[3] Additional depth and width of channel due to wave climate encountered within this segment.

The side slopes of the channel vary from 1:7 through Petit Bois Pass and 1:5 within Mississippi Sound to a point approximately 3,000 feet below the turning basin within the bayou. From that location, the side slopes transition to 1:3 for the remaining portion of the bayou channel segments and Snake Bayou. The 1:3 side slope within the bayou was incorporated in order to minimize the impacts to adjacent structures and is supported by the results of the geotechnical investigations contained in Appendix E, Engineering Data and Cost Estimates.

C. Bulkhead/Pier Replacement Analysis. Existing bulkheads and piers are located extensively within Bayou La Batre and Snake Bayou. Plates 5, 6 and 7 show the locations of existing bulkheads and piers at the project. From a point about midway between the mouth of the bayou (130+00) and the turning basin (30+00) to the study limits of the bayou (-15+10), the bayou is almost solidly bulkheaded on each side of the existing channel. There are presently over 20,000 linear feet of existing bulkhead within Bayou La Batre and Snake Bayou and over 9,000 linear feet of pier. Most of the bulkheads are of wood while the remainder are steel or concrete. The piers are all wooden. The bulkheads are utilized for docking, fueling, loading supplies, and unloading the catch from commercial fishing vessels.

The purposes of the bulkhead/pier analysis are:

- Determine replacement quantities and cost for existing bulkheads and piers that would, due to potential failure during construction of a deepened channel, cause channel obstruction and impacts to adjacent infrastructure.
- Determine which existing bulkheads and piers would potentially require replacement due to adjacent berthing area dredging in addition to those required due to channel deepening.
- Determine the cost of in-kind replacement of potentially impacted bulkheads and piers under the future without project condition.
- Investigate the potential use and cost of various types of replacement bulkheads as well as additional bulkheads needed for property protection.

The results of the channel design - top of cut and dredge line at each bulkhead or pier from channel deepening and potential depths of berthing areas - were utilized to determine the potential impacts of the various channel depths to existing bulkheads and piers. On-site inventories were conducted to determine the type and, as much as possible, condition of existing bulkheads and piers. Little information exists pertaining to depth or condition of piling and other features of existing bulkheads and piers at Bayou La Batre. For the purposes of this study, it was presumed that the depth of penetration of existing bulkheads and piers was at a minimum for existing conditions and that any deepening of the channel or berthing area immediately adjacent to the structure would result in failure, thereby necessitating replacement.

Two quantities of bulkhead and pier replacements were identified for the project: bulkhead and pier replacements due to channel deepening but without berthing areas and replacements with berthing area deepening. The quantities of bulkhead and pier replacements for channel deepening without berthing area dredging are those considered critical for project construction to avoid potential failure causing channel obstruction or damage to adjacent buildings and other infrastructure. Bulkhead and pier replacement quantities and costs for those potentially affected by berthing area deepening were used in calculating the economic costs of the project while those due to channel deepening represent the expected bulkhead/pier replacement financial costs for project construction. In all cases, the bulkhead/pier replacement costs were calculated based upon replacement in their current locations; therefore, no land costs would be incurred due to bulkhead/pier replacements. It should be noted that the costs of bulkhead replacements with berthing areas was based upon a worst case scenario, assuming that practically all berthing areas within the bayou would be deepened and that adjacent bulkheads would be replaced. These costs were used to test for economic feasibility of the project and do not represent the costs of bulkhead replacements for project construction.

Table XIV contains the total linear feet of bulkhead and pier replacements identified for the various channel depths without berthing areas at Bayou La Batre and includes those within Snake Bayou. In addition, a quantity of bulkheads for property protection is also shown. Additional bulkhead requirements for property protection were determined for properties adjacent to Bayou La Batre that currently are without bulkheads and which would be substantially affected by the side slopes of a deepened channel. Due to the value of those adjacent properties, a qualitative determination was made that the cost of bulkheads was at least equal to the potential cost of damages to those properties. Additionally, in order for those properties to be utilized for income producing purposes in conjunction with the channel, a future bulkhead would be required.

TABLE XIV
TOTAL BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING, WITHOUT BERTHING AREAS
BAYOU LA BATRE AND SNAKE BAYOU

Channel Depth (Ft.)	Existing Bulkhead (L.F.)	Existing Pier (L.F.)	Bulkhead for Property Protection (L.F.)
14	4,575	750	1,670
16	5,645	1,470	2,070
18	6,265	1,740	2,120
20	6,765	1,800	2,670
22	7,335	2,160	2,770

Table XV contains the total linear feet of existing bulkhead and pier potentially affected by the channel deepening and, additionally, from deepening of berthing areas immediately adjacent to these structures. The quantities of bulkhead and pier shown in Table XIV are included in those contained in Table XV.

TABLE XV
TOTAL BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING WITH BERTHING AREAS
BAYOU LA BATRE AND SNAKE BAYOU

Channel Depth (Ft.)	Existing Bulkhead (L.F.)	Existing Pier (L.F.)	Bulkhead for Property Protection (L.F.)
14	12,760	3,360	1,670
16	12,760	3,360	2,070
18	12,760	3,360	2,120
20	12,760	3,360	2,670
22	12,760	3,360	2,770

The quantity of existing bulkhead and pier replacements shown in Table XV for berthing area deepening do not vary by channel depth as with the quantities shown in Table XIV. The reason is that, although particular channel users would utilize a deeper channel, if available; these same users would deepen their berthing area to correspond to the depth of the available channel to increase operational efficiency. For example, if the channel was deepened to 14 feet, those users which might desire a deeper channel would still deepen their berthing areas to take advantage of the existing channel, thereby incurring costs for bulkhead replacement. Conversely, if the channel were deepened to 22 feet, those users that require depths less than the existing channel would deepen their berthing areas to the depth suitable for their needs.

Plates 5, 6 and 7 show the existing bulkheads and piers adjacent to the Bayou La Batre channel and Snake Bayou. The quantities of bulkhead and pier shown in Table XV for the various channel depths were those utilized in the determination of average annual replacement costs for the future without and with project conditions.

The average annual bulkhead and pier replacement cost calculated for the without project condition was based upon in kind replacement of existing bulkheads and piers at intervals over a 50-year period determined by existing type and condition of structure. For this assessment and for determining the average annual incremental cost of bulkhead replacement with project, the following bulkhead types and replacement intervals, based on expected economic life of new bulkheads, were used: timber, 25 years; steel sheetpile, 25 years; concrete 50 years. Due to the varied condition of existing bulkheads at the project, the following replacement intervals for certain existing bulkheads under future without project condition were used: 1st, 5th, 10th, 15th, 25th, 30th, 35th, and 40th years.

Table XVI contains the average annual cost of affected bulkhead and pier replacements for the without project condition by channel segment. These costs were derived by computing the net present worth of bulkhead and pier replacements over the 50-year project life at those intervals previously stated. The net present worth of bulkhead and pier replacement for each channel depth and segment was then annualized over the project life at an interest rate of 8.625%.

TABLE XVI
AVERAGE ANNUAL COST
AFFECTED BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING, WITHOUT BERTHING AREAS
WITHOUT PROJECT CONDITION
($1,000)

Channel Depth	Channel Segment Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$ 89.8	$45.6	$43.1	$15.6
16'	141.5	n/a	n/a	n/a
18'	160.8	n/a	n/a	n/a
20'	185.9	n/a	n/a	n/a
22'	205.6	n/a	n/a	n/a

Table XVII contains the average annual cost of affected bulkhead and pier replacements calculated as described for Table XVI but includes channel and berthing area deepening.

TABLE XVII
AVERAGE ANNUAL COST
AFFECTED BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING WITH BERTHING AREAS
WITHOUT PROJECT CONDITION
($1,000)

Channel Depth	Channel Segment Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$414.1	$53.0	$55.6	$15.6
16'	414.1	n/a	n/a	n/a
18'	414.1	n/a	n/a	n/a
20'	414.1	n/a	n/a	n/a
22'	414.1	n/a	n/a	n/a

Three types of replacement bulkheads were evaluated for project construction: timber, steel and concrete. Two variations of concrete bulkhead were evaluated: cantilevered and anchored. The least expensive first cost resulted from anchored concrete bulkheads down to dredge line elevation -9 feet and anchored steel bulkheads below that elevation. The most favorable 50-year cost resulted from anchored concrete bulkhead at all dredge line elevations. The first costs for these bulkhead and pier replacements at the various project depths and by channel segment are shown in Tables XVIII and XIX.

TABLE XVIII
FIRST COSTS
AFFECTED BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING, WITHOUT BERTHING AREAS
WITH PROJECT CONDITION
($1,000)

	Channel Segment			
Channel Depth	Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$ 2,441.0	$1,392.0	$1,885.0	$367.0
16'	4,217.0	n/a	n/a	n/a
18'	5,040.0	n/a	n/a	n/a
20'	6,997.0	n/a	n/a	n/a
22'	10,025.0	n/a	n/a	n/a

TABLE XIX
FIRST COSTS
AFFECTED BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING WITH BERTHING AREAS
WITH PROJECT CONDITION
($1,000)

	Channel Segment			
Channel Depth	Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$13,236.0	$1,882.0	$2,389.0	$367.0
16'	15,804.0	n/a	n/a	n/a
18'	16,489.0	n/a	n/a	n/a
20'	17,389.0	n/a	n/a	n/a
22'	18,474.0	n/a	n/a	n/a

Tables XX and XXI contain the average annual incremental costs of bulkhead and pier replacements by channel depth and segment. The average annual incremental costs are the result of average annual first costs, including interest during construction, minus the average annual replacement costs calculated for the without project condition.

TABLE XX
AVERAGE ANNUAL INCREMENTAL COSTS
BULKHEAD AND PIER REPLACEMENTS
CHANNEL DEEPENING, WITHOUT BERTHING AREAS
WITH PROJECT CONDITION
($1,000)

	Channel Segment			
Channel Depth	Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$152.4	$92.7	$144.0	$20.8
16'	277.0	n/a	n/a	n/a
18'	339.3	n/a	n/a	n/a
20'	508.4	n/a	n/a	n/a
22'	789.2	n/a	n/a	n/a

TABLE XXI
AVERAGE ANNUAL INCREMENTAL COSTS
BULKHEAD AND PIER REPLACEMENT
CHANNEL DEEPENING WITH BERTHING AREAS
WITH PROJECT CONDITION
($1,000)

	Channel Segment			
Channel Depth	Mouth through Turning Basin	Turning Basin To Bridge	Above Bridge	Snake Bayou
14'	$ 899.3	$133.8	$181.5	$20.8
16'	1,154.2	n/a	n/a	n/a
18'	1,222.1	n/a	n/a	n/a
20'	1,311.4	n/a	n/a	n/a
22'	1,419.1	n/a	n/a	n/a

D. Utility Relocations Analysis. The utility relocations required for the project consist of two force mains, one 6-inch cast iron and one 6-inch PVC, which cross the channel below the Highway 188 bridge. There are other utilities which cross the channel; however they are at sufficient depth that no relocations are necessary. The 6-inch PVC force main crosses the channel below the turning basin while the 6-inch cast iron force main crosses the channel immediately above. Both of these utilities are shown on Plate 2.

The relocations of these force mains would be accomplished through directional drilling. Top of pipe elevations of the relocated force mains would be -30 feet MLW and -22 feet MLW for the PVC and cast iron line, respectively. The total first cost plus interest during construction for these two relocations is $349,500. The average annual cost is $30,600.

E. Dredged Material Disposal Alternatives.

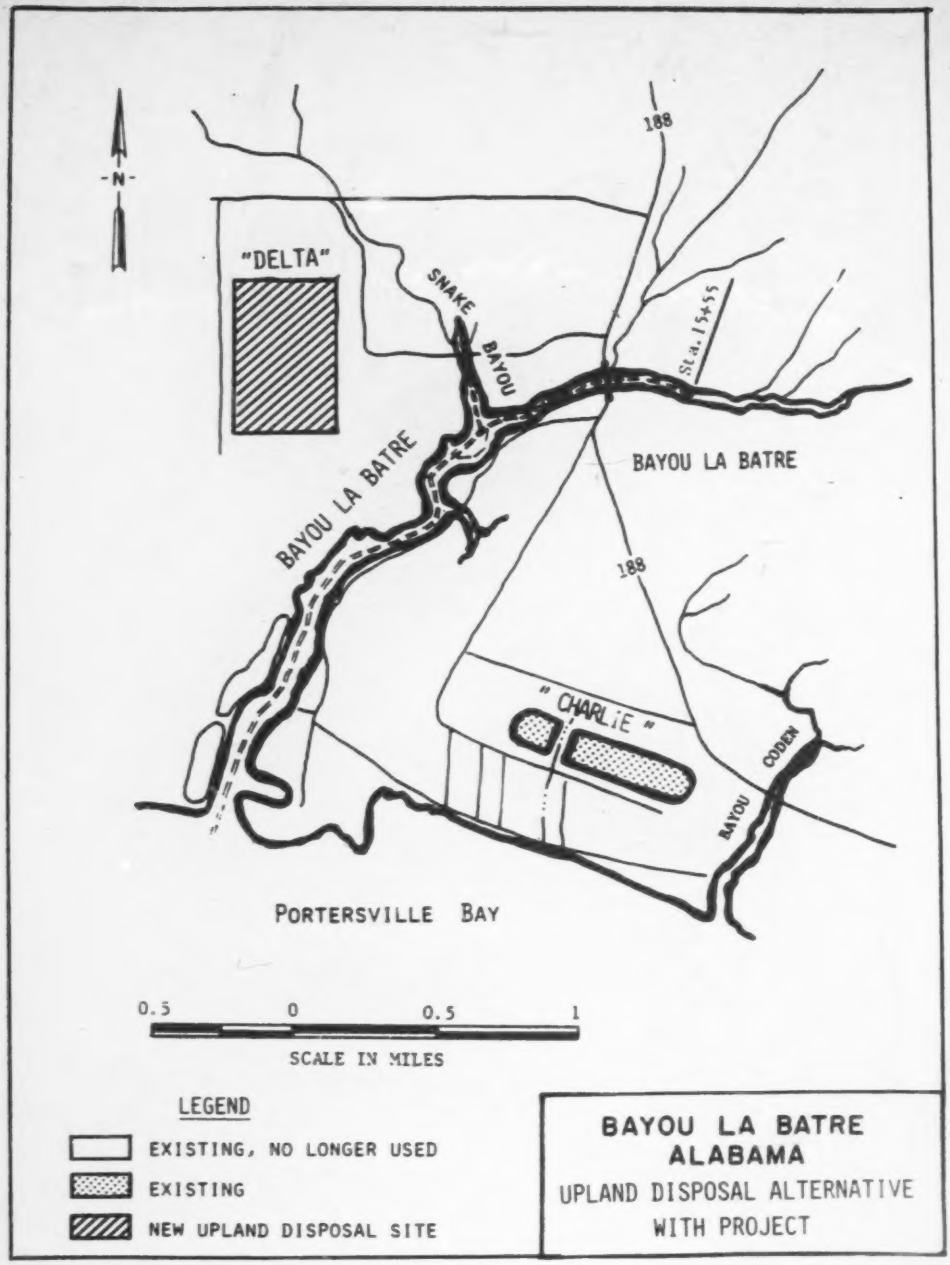
1. General. Initially, a total of 13 conceptual alternatives for disposal of construction and maintenance dredged material were identified and evaluated for cost effectiveness and environmental acceptability. The initial list of disposal alternatives is as follows:

- Into existing upland disposal area "Charlie".
- Into existing diked areas "Alpha" and "Beta".
- Into new upland disposal area "Delta".
- Expansion of disposal area "Charlie".
- Confined disposal at Point aux Pins - Isle aux Dames area.
- Confined disposal at Isle aux Herbes (Coffee Island).
- Construction of a submerged berm within Mississippi Sound.
- Open water disposal within Mississippi Sound.
- Thin-layer disposal within Mississippi Sound.
- Littoral zone disposal.
- Barrier island nourishment.
- Gulf disposal in the Mobile North Ocean Dredged Material Disposal Site (ODMDS).
- Gulf disposal in the Pascagoula ODMDS.

Several of the conceptual alternatives were qualitatively eliminated from further consideration due to cost and/or environmental reasons. The use of diked areas "Alpha" and "Beta" was eliminated due to the restricted size of the areas and the presence of emergent wetland vegetation in "Beta". Island creation within Mississippi Sound was found not feasible due to the lack of dredged material suitable for that purpose. Barrier island nourishment was eliminated due to excessive cost and potential environmental impacts to grassbeds located along the north shoreline of Petit Bois Island.

Certain configurations of the conceptual alternatives were eliminated from consideration, although the concept remained for other aspects of the project. For example, the concept of open water disposal in Mississippi Sound was retained while consideration for open water disposal in Mississippi Sound in waters less than 12 feet deep was eliminated due to possible mounding and potential effects on circulation and/or nearby nursery areas within Portersville and Grand Bays. Gulf disposal of maintenance material from the sound channel segment was eliminated due to operational constraints and excessive cost. Gulf disposal of maintenance material from the GIWW channel was eliminated due to lack of material quantity and excessive cost.

Considering the alternative channel depths, potential combinations of the major channel segments, and the number of disposal alternatives for construction and maintenance dredged material; the number of dredged material disposal alternative configurations numbered into the hundreds. Detailed descriptions of the dredged material disposal alternatives considered for the project are contained in the draft Environmental Impact Statement. The cost estimates for with project construction and maintenance and without project maintenance material dredging and disposal by channel segment, combinations of segments, and depth are contained in Appendix E, Engineering Data and Cost Estimates. These estimates include first costs and average annual costs for construction and maintenance material dredging and disposal alternatives. Figures 16 and 17 contain the alternative dredged material disposal locations for the project.


-N-
"DELTA"
SNAKE BAYOU
BAYOU LA BATRE
188
Sta. 15+55
BAYOU LA BATRE
188
" CHARLIE "
CODEN BAYOU
PORTERSVILLE BAY
0.5
0
0.5
1
SCALE IN MILES
LEGEND
☐ EXISTING, NO LONGER USED
▒ EXISTING
▨ NEW UPLAND DISPOSAL SITE

BAYOU LA BATRE
ALABAMA
UPLAND DISPOSAL ALTERNATIVE
WITH PROJECT

FIGURE 16

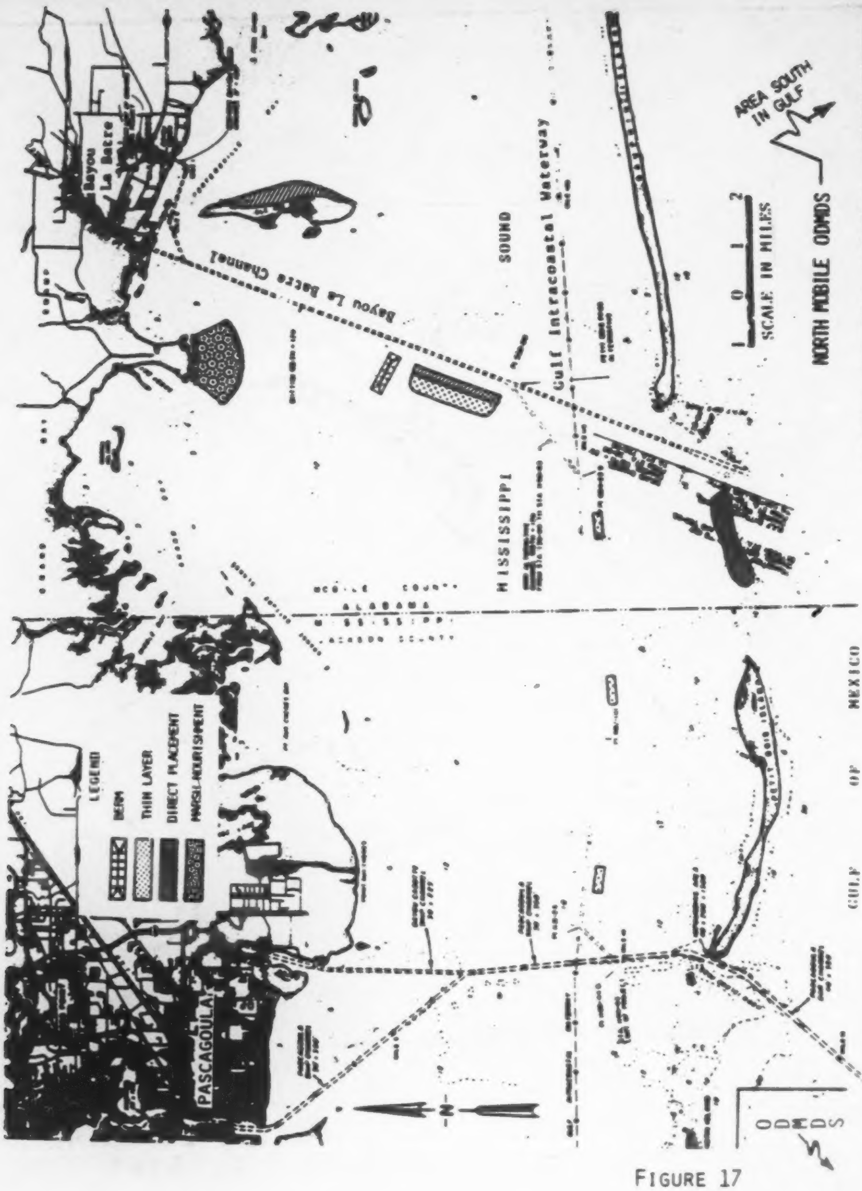

LEGEND
BERM
THIN LAYER
DIRECT PLACEMENT
MARSH NOURISHMENT
PASCAGOULA
Bayou La Batre
Bayou La Batre Channel
SOUND
Gulf Intracoastal Waterway
MISSISSIPPI
MOBILE COUNTY
ALABAMA
MISSISSIPPI
JACKSON COUNTY
GULF OF MEXICO
N
ODMDS
0 1 2
SCALE IN MILES
NORTH MOBILE ODMDS
AREA SOUTH IN GULF

FIGURE 17

DREDGED MATERIAL DISPOSAL ALTERNATIVES
MISSISSIPPI SOUND

V. PLAN FORMULATION.

A. General. The following section describes the objectives, constraints, methodology and result of the plan formulation process for navigation improvements at Bayou La Batre, Alabama. The purpose of the formulation process is to identify plans which are publicly acceptable, impenetrable, and feasible from economic, environmental, engineering, and sociological standpoints.

B. General Methodology. The broad basis for plan formulation by the Corps of Engineers is contained in the Water Resources Council's (WRC) "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies." As stated in these Principles and Guidelines (P&G), the Federal objective of water and related land resources project planning is to contribute to National Economic Development (NED) consistent with protecting the nation's environment. The P&G further states that Federal water resources planning is to be responsive to state and local concerns, and project plans are to be formulated to alleviate problems and take advantage of opportunities in the study area.

1. Objectives. During the early stages of this study, specific plan formulation objectives were identified which were consistent with the broad planning framework previously outlined. These formulation objectives were:

- Development of alternative plans in a systematic manner to insure that all reasonable alternatives were evaluated.

- Identification of a plan that reasonably maximized net NED benefits, consistent with the Federal objective.

2. Constraints. In addition to the planning objectives previously stated, plan formulation for the Bayou La Batre study area was influenced by some specific limitations as recognized during initial investigations of the study area. These limitations were classified and are listed below under the categories of technical constraints, environmental constraints, and sociological constraints.

- Technical Constraints.

  - Widening of the existing Federal channel within the bayou can not be accomplished without significant relocations of existing infrastructure.

  - Widening of the existing Federal channel within the constraints of the adjacent development would not result in increased efficiencies due to existence of structures and docked vessels requiring operation of vessels at no wake speeds within the bayou.

- The width of a navigation channel above the Highway 188 lift span bridge is constrained by the horizontal spacing of the bridge piling.

- Economic Constraints.

  - The justifiable first cost of navigation improvements at the project is constrained by the level of average annual operational and vessel damage costs attributable to the existing channel.

  - Each separable unit of improvement or purpose of proposed plans must provide economic benefits at least equal to its cost, unless justified on the basis of enhanced environmental and/or social effects.

- Environmental Constraints. Plans for Federal participation should be formulated to comply with the requirements of the following.

  - EO11593 on Protection and Enhancement of the Cultural Environment, 13 May 1971.

  - EO11990 on the Protection of Wetland Areas, 24 May 1977.

  - The National Environmental Policy Act (42 U.S.C. 4321 et. seq.).

  - The Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et. seq.).

  - The Fish and Wildlife Coordination Act (16 U.S.C. 661 et. seq.).

  - The National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 et. seq.).

  - The Preservation of Historic Archaeological Data Act of 1974 (16 U.S.C. 469 et. seq.).

  - The Clean Air Act, as amended (42 U.S.C. 7609).

  - The Clean Water Act of 1977 (33 U.S.C. 1251 et. seq.).

  - The Coastal Zone Management act of 1972, as amended (16 U.S.C. 1451 et. seq.).

  - The Estuary Protection Act (16 U.S.C. 1221 et. seq.).

  - The land and Water Conservation Fund Act (16 U.S.C. 4601 et. seq.).

  - The Marine Protection Research and Sanctuaries Act of 1972, as amended (16 U.S.C. 1401 et. seq.).

- Sociological Constraints. Plans should be formulated in such a way as to minimize and, if possible, avoid the following:

  - Destruction of community cohesion.
  - Injurious displacement of people.
  - Disruption of desirable community growth.
  - Undesirable alteration of recreational opportunities.

C. Plan Formulation Methodology for the Bayou La Batre Project. The following describes the methodology employed in the formulation of alternative plans for navigation improvements for the Bayou La Batre project. Since the alternatives to reduce the operational inefficiencies at the project were confined to channel modification, the formulation of detailed plans concentrated on identifying the most desirable combination of: channel depth, channel extension(s), alignments, dredging method(s), dredged material disposal measures, bulkhead/pier replacement, and utility relocations. The number of alternative plans which were formulated for the project was monumental due to the number of potential combinations of alternative depths, channel segments and alignments, and alternative dredged material disposal measures.

Based upon the desires of the cost share sponsor and the results of the economic analysis for the project, the following major items were included in the plan formulation process to determine feasibility for:

- Deepening the existing Federal channel from the 12-foot depth contour in Mississippi Sound to the turning basin (30+00) within the bayou to navigation depths of 14 feet, 16 feet, 18 feet, 20 feet and 22 feet.

- Deepening the existing Federal channel from the turning basin (30+00) to the Highway 188 bridge (0+00) to a navigation depth of 14 feet.

- Extending the existing Federal channel to a point approximately 1,500 feet above the Highway 188 bridge (to Sta. -15+10) at a navigation depth of 14 feet.

- Extending the existing Federal channel approximately 1,350 feet into Snake Bayou at a navigation depth of 14 feet from Sta. 0+00 to Sta. 5+33 thence 12 feet to Sta. 13+47.

- Extending the existing Federal channel through Petit Bois Pass at navigation depths of 15 feet, 17 feet, 19 feet, 21 feet and 23 feet.

- Extending the existing Federal navigation channel westward along the existing GIWW alignment to the Pascagoula Ship Channel at navigation depths of 14 feet, 16 feet, 18 feet, 20 feet and 22 feet.

The first step in the formulation process was to determine the ultimate configuration of the bayou channel(s). The proposed extensions of the existing Federal project into Snake Bayou and deepening and extending the channel above the turning basin to Sta. -15+10 above the Highway 188 bridge were evaluated incrementally, i.e. each of these segments was evaluated for feasibility based solely on the benefits derived from improvements within that segment versus the costs of those improvements. Since a range of channel depths was not considered for each of these segments, determination of feasibility was simplified. Table XXII contains the total average annual equivalent benefits and costs for each of those channel segments.

TABLE XXII
TOTAL AVERAGE ANNUAL EQUIVALENT BENEFITS AND COSTS
CHANNEL EXTENSIONS INTO SNAKE BAYOU AND
ABOVE THE HIGHWAY 188 BRIDGE
($1,000)

Channel Segment	Average Annual Benefits	Average Annual Costs	Net Benefits
Snake Bayou	$310.2	$ 39.8	$270.4
Above Turning Basin	488.2	391.5	96.7

The positive net benefits for both channel segments shown in Table XXII indicates feasibility. Therefore, these channel segments were included in all other plans formulated for the project and required no further consideration.

The second step in the process was the creation of a very large array, consisting of over 100 alternative plans, which combined in various ways the major channel segments, channel depths, and dredged material disposal options. Average annual incremental costs were determined for each channel segment and depth, and for each construction and maintenance material disposal option. These estimates are contained in Appendix E, Engineering Data and Cost Estimates. Table XXIII contains an array of plans for all project depths considered for the project and includes those plans with the most economical dredged material disposal alternatives identified for the project. The average annual benefits and costs for Snake Bayou and above the turning basin are also included in Table XXIII.

TABLE XXIII
ALTERNATIVE PLANS, ALL CHANNEL DEPTHS
BAYOU LA BATRE, ALABAMA

Depth	Symbol	Average Annual Benefits ($1,000)	Average Annual Costs ($1,000)	Total Net Benefits ($1,000)
14 Feet	BA+SB+GA	$1,997.4	$1,660.6	$ 336.8
16 Feet	BA+SB+GA	3,224.5	2,030.7	1,193.8
18 Feet	BA+SB+GA	5,948.4	2,188.9	3,759.5
20 Feet	BA+SB+GA	5,963.6	2,490.5	3,473.1
22 Feet	BA+SB+GA	5,963.6	2,709.0	3,254.6
14 Feet	BA+SB+PA	$2,074.3	$2,274.3	$ (200.0)
16 Feet	BA+SB+PA	3,301.4	2,745.6	555.8
18 Feet	BA+SB+PA	6,025.3	2,875.9	3,149.4
20 Feet	BA+SB+PA	6,040.5	3,231.9	2,808.6
22 Feet	BA+SB+PA	6,040.5	3,446.5	2,594.0

A comparison of the average annual incremental costs and average annual benefits associated with each alternative resulted in a clear indication that plans with an 18-foot depth provided the greatest net economic benefits. Therefore, further plan formulation concerning more detailed engineering and environmental considerations was performed on a final array of 18 alternative plans at the 18-foot channel depth. The 18 alternative plans for the 18-foot depth represent combinations of channel segments and certain construction and maintenance dredged material disposal options.

Table XXIV contains the final array of alternative plans at the 18-foot depth, listed symbolically, which were evaluated for the Bayou La Batre feasibility study. The symbols for each alternative plan represent each major channel segment - bayou, Mississippi Sound, Petit Bois Pass or GIWW - and alternative dredged material disposal options for both construction and maintenance material. Descriptions of each symbol are on page 86. Also listed within the table are the average annual benefits, average annual incremental costs, and net benefits. The average annual benefits and costs for the Snake Bayou channel and the deepening and channel extension above the turning basin in Bayou La Batre are not included in Table XXIV. The average annual benefits and costs associated with these two channel segments would apply equally to all alternative plans listed in Table XXIV.

TABLE XXIV
ALTERNATIVE PLANS
BAYOU LA BATRE, ALABAMA

Alternative Plan	Symbol	Average Annual Benefits ($1,000)	Average Annual Costs ($1,000)	Total Net Benefits ($1,000)
I	BA+SA+PA	$6,025.3	$2,932.1	$3,093.2
II	BA+SB+PA	6,025.3	2,875.9	3,149.4
III	BA+SC+PA	6,025.3	2,953.6	3,071.7
IV	BA+SD+PA	6,025.3	2,900.8	3,124.5
V	BA+SA+PB	6,025.3	3,055.4	2,969.9
VI	BA+SB+PB	6,025.3	2,999.2	3,026.1
VII	BA+SC+PB	6,025.3	3,076.9	2,948.4
VIII	BA+SD+PB	6,025.3	3,024.1	3,001.2
IX	BA+SE+PB	6,025.3	3,257.4	2,767.9
X	BA+SA+GA	5,948.4	2,245.1	3,703.3
XI	BA+SB+GA	5,948.4	2,188.9	3,759.5
XII	BA+SC+GA	5,948.4	2,266.6	3,681.8
XIII	BA+SD+GA	5,948.4	2,213.8	3,734.6
XIV	BA+SE+GB	5,948.4	2,462.6	3,485.8
XV	BA+SA+GC	5.948.4	2,277.4	3,671.0
XVI	BA+SB+GC	5,948.4	2,221.2	3,727.2
XVII	BA+SC+GC	5.948.4	2,298.9	3,649.5
XVIII	BA+SD+GC	5,948.4	2,246.1	3,702.3

The result of the analysis shown in Table XXIV is that net benefits are maximized by Plan XI, with net average annual NED benefits of $3,759,500 and a benefit to cost ratio of 2.7 to 1. The net average annual benefits, totaling $508,600, for the Snake Bayou channel and the channel improvements above the turning basin in Bayou La Batre are included in this table.

The description of the symbols used to identify the alternative plans presented in Tables XXIII and XXIV are as follows:

Bayou Channel Segment:

BA	New work and maintenance material to upland disposal areas "Delta" and existing "Charlie".

Mississippi sound Channel Segment:

SA	New work material split between Point aux Pins and open water deeper than 12 feet. Maintenance material to open water greater than 12 feet deep.
SB	New work material split between Isle aux Herbes and open water deeper than 12 feet. Maintenance material to open water greater than 12 feet deep.
SC	All New work material to Isle aux Herbes. Maintenance material to open water greater than 12 feet deep.
SD	New work and maintenance material to open water greater than 12 feet deep.
SE	New work material to ODMDS, only in conjunction with PB or GB. Maintenance material to open water greater than 12 feet deep.

Petit Bois Pass Channel Segment.

PA	New work material in littoral zone. Maintenance material disposal rotating between littoral zone and ODMDS on an 18-month cycle.
PB	New work material to ODMDS, alone or in conjunction with SE. Maintenance material disposal between littoral zone and ODMDS on an 18-month cycle.

GIWW Channel Segment.

GA	New work and maintenance material to open water approximately 5,000 feet south of channel.
GB	New work material to Pascagoula ODMDS, only in conjunction with SE. Maintenance material to open water 5,000 feet south of channel.
GC	New work material in littoral zone 10,000 feet south of channel. Maintenance material to open water 5,000 feet south of channel.

D. Recommended Plan. Based upon the economic, engineering and environmental analyses of alternative plans evaluated for the Bayou La Batre Feasibility Study, alternative Plan XI with the Snake Bayou channel segment and channel improvements, above the turning basin in Bayou La Batre reasonably maximizes net NED benefits for the project and is the recommended plan for the project. The features and description of this plan are:

- Deepening the existing 12' x 100' Federal channel within the bayou to a navigation depth of 18 feet, plus an additional 1 foot for advance maintenance and 1 foot for allowable overdepth, from the mouth of Bayou La Batre (130+00) to the turning basin (30+00).

- Deepening the existing 12' x 75' Federal channel within the bayou from the turning basin (30+00) to the Highway 188 bridge (0+00) to a navigation depth of 14 feet plus 1 foot advance maintenance and 1 foot allowable overdepth.

- Extending a 14' x 75' channel from the Highway 188 bridge (0+00) to Sta. -15+10 above the bridge.

- Extending a 14' x 50' channel from the intersection of Snake Bayou and Bayou La Batre at the turning basin (Sta. 0+00 for Snake Bayou) into Snake Bayou to Sta. 5+33, then a 12' x 50' channel from Sta. 5+33 to Sta. 13+47.

- Extending and widening the existing 12' x 100' Federal channel within Mississippi Sound south to connect with the GIWW (536+00) then westward along the existing GIWW alignment to the Pascagoula Ship Channel (1185+45). The dimensions of this channel are 18' x 120' with 1 foot advance maintenance and 1 foot allowable overdepth.

The construction and maintenance dredged material disposal measures incorporated with this plan are:

- New work dredged material from Snake Bayou and Bayou La Batre to Sta. 90+45 within Bayou La Batre into a new 107-acre upland disposal area "Delta". New work dredged material from Sta. 90+45 within Bayou La Batre to the mouth (130+00) into existing upland disposal area "Charlie". Maintenance dredged material from Snake Bayou and Bayou La Batre to Sta. 90+45 within Bayou La Batre into new upland disposal area "Delta". Maintenance dredged material from Sta. 90+45 within Bayou La Batre to Sta. 155+00 in Mississippi Sound disposed into existing upland disposal area "Charlie". See Figure 18.

- New work dredged material disposal from the mouth of Bayou La Batre (130+00) to the GIWW (536+00) split between the eastern shoreline of Isle aux Herbes and direct placement in open water greater than 12 feet deep to the west of the channel. Maintenance material from this segment will be disposed in open water greater than 12 feet deep west of the channel. The maintenance material would be disposed using thin layer technique. See Figure 19.

- Direct placement of new work and thin layer of maintenance dredged material from along the GIWW west to the Pascagoula Ship Channel, Sta. 536+00 to Sta. 1185+45, in open water greater than 12 feet deep at a distance of 5,000 feet south of the channel alignment. See Figure 19.

E. First Costs of Recommended Plan. The estimated first costs and funding schedule for construction of the recommended plan for the project is contained in Tables XXV and XXVI. The preconstruction engineering and design cost estimate is contained on Table XXVII. Table XXV contains the estimated first costs for project construction based upon October 1988 price levels while the costs in Table XXVI are indexed for inflation. The costs were indexed from October 1988 (F.Y. 1989) price levels. The multipliers used were 1.10, 1.19 and 1.22 for F.Y. 1990, F.Y. 1991 AND F.Y. 1992, respectively. The multipliers were obtained from EC 11-2-154, Annual Program and Budget Request for Civil Works, Corps of Engineers, F.Y. 1990.

F. Environmental Impacts of Recommended Plan. Implementation of this plan would result in the conversion of approximately 107 acres of upland pine forest to disposal area. In addition, any vegetation growing within the existing upland disposal area "Charlie" would be impacted during placement of dredged material. Management of these sites would restrict vegetation growth in the site between maintenance cycles. No emergent wetlands would be directly impacted; however, wetlands along the eastern shore of Isle aux Herbes could be directly affected. This plan, as formulated, provides an opportunity to utilize a portion of the new work dredged material from the Mississippi Sound channel segment in a beneficial way by providing some measure of erosion protection to the wetlands along the northeastern shore of the island. As described earlier the Isle aux Herbes shoreline is undergoing erosion at an average of 6.7 feet per year. The island is a very low profile marsh area which contributes to the overall well being of the eastern Mississippi Sound. The berm will provide physical protection to these wetlands from wave attack and will provide a sediment source for the maintenance of the wetlands. Adverse impacts to these resources could occur from the increased turbidity associated with the disposal operation. However, it is believed that the long term benefits associated with protecting existing resources outweighs the possible short term impacts.

Approximately 160 acres of estuarine bottoms between 3 and 6 feet deep could be impacted by placement of dredged material at Isle aux Herbes. Of these, approximately 60 acres would be converted to emergent bar while the remainder would become intertidal to shallow submerged in nature.

Approximately 1.5 and 2.6 acres of previously undisturbed bottoms in Snake Bayou and above the Highway 188 bridge, respectively, would be impacted during dredging. Dredging within the bayou south of the Highway 188 bridge would impact about 29 acres of bottoms which are currently dredged on a 3-year cycle.

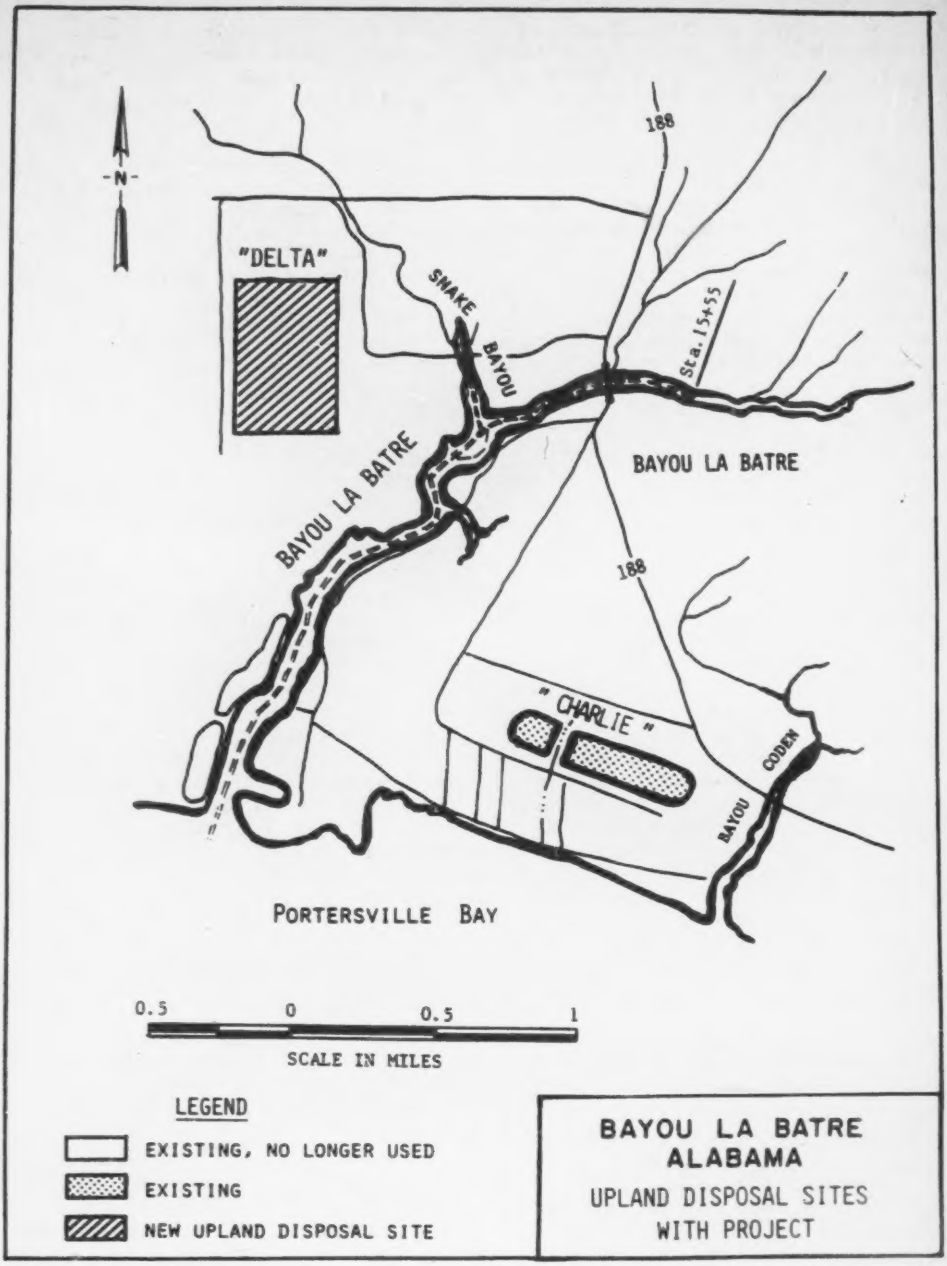

N
188
"DELTA"
SNAKE BAYOU
Sta. 15+55
BAYOU LA BATRE
BAYOU LA BATRE
188
"CHARLIE"
BAYOU CODEN
PORTERSVILLE BAY
0.5 0 0.5 1
SCALE IN MILES
LEGEND
EXISTING, NO LONGER USED
EXISTING
NEW UPLAND DISPOSAL SITE
BAYOU LA BATRE
ALABAMA
UPLAND DISPOSAL SITES
WITH PROJECT

FIGURE 18

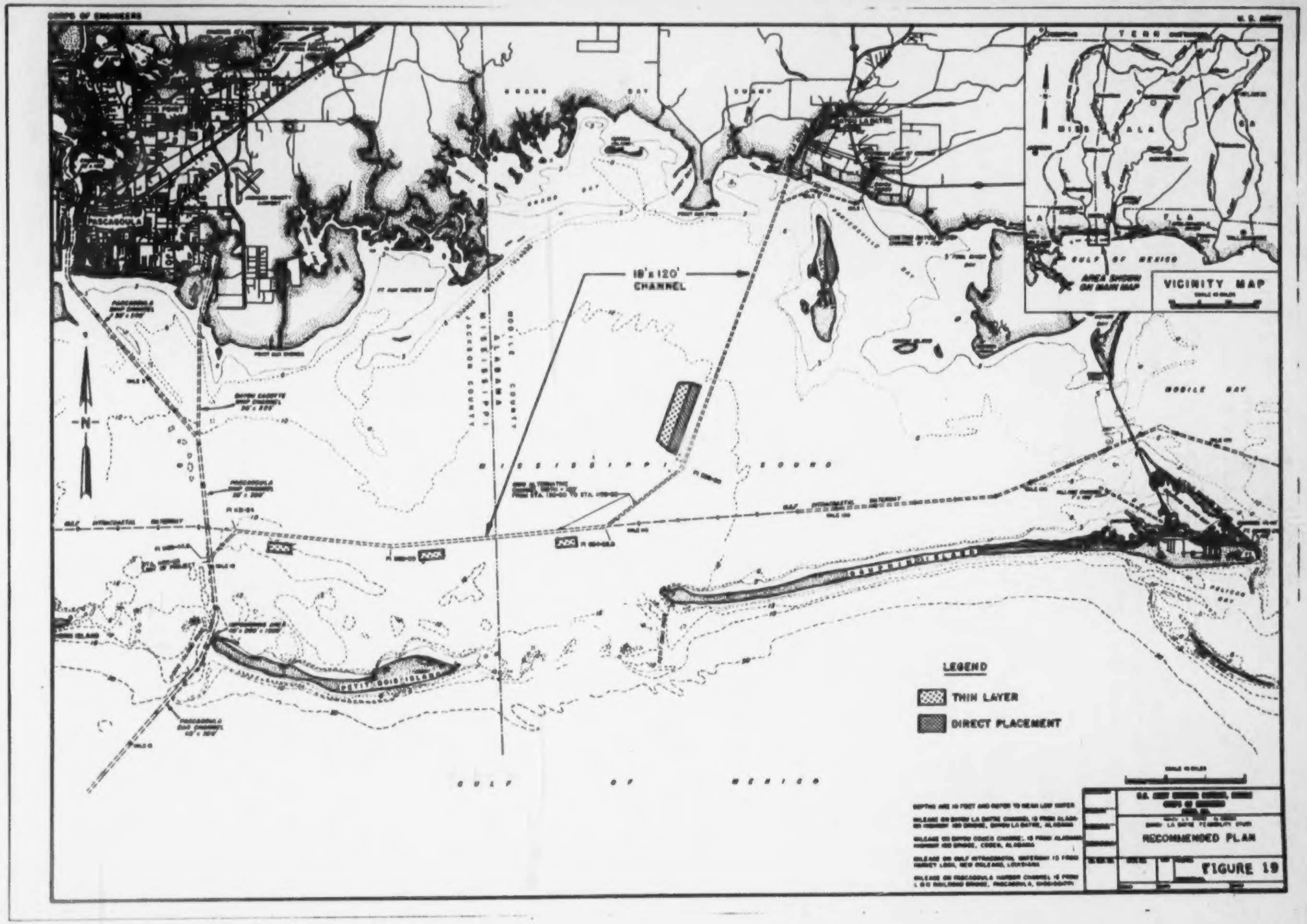

CORPS OF ENGINEERS
U. S. ARMY
VICINITY MAP
AREA SHOWN ON MAIN MAP
GULF OF MEXICO
MOBILE BAY
18' x 120' CHANNEL
MOBILE COUNTY
ALABAMA
MISSISSIPPI
JACKSON COUNTY
MISSISSIPPI SOUND
GULF INTRACOASTAL WATERWAY
PASCAGOULA
GULF OF MEXICO
LEGEND
THIN LAYER
DIRECT PLACEMENT
RECOMMENDED PLAN
FIGURE 19

TABLE XXV
FIRST COSTS AND EXPENDITURE SCHEDULE
FEDERAL AND NON-FEDERAL FIRST COSTS
(October 1988 Prices)

ITEM	TOTAL COST ($1,000)	F.Y. 1989	F.Y. 1990	F.Y. 1991	F.Y. 1992
GENERAL NAVIGATION FEATURES (GNF)					
CHANNELS AND CANALS:					
CONTRACT 1:					
GIWW Segment (536+00 to 1185+45)	$769.1	$0.0	$0.0	$769.1	$0.0
Sound Channel Segment (130+00 to 536+00)	2,066.8	0.0	0.0	2,066.8	0.0
Dredged Material Stabilization at Isle aux Herbes	39.0	0.0	0.0	39.0	0.0
CONTRACT 2:					
Bayou Channel to Turning Basin (130+00 to 30+00)	532.6	0.0	0.0	0.0	532.6
Bayou Channel Above Turning Basin (30+00 to -15+55)	216.0	0.0	0.0	0.0	216.0
Snake Bayou Channel (0+00 to 13+47)	97.0	0.0	0.0	0.0	97.0
ENGINEERING & DESIGN	388.0	170.0	125.0	68.9	24.1
SUPERVISION & ADMINISTRATION	126.0	21.0	9.0	77.8	18.2
TOTAL GENERAL NAVIGATION FEATURES	$4,234.5	$191.0	$134.0	$3,021.6	$887.9
NAVIGATION AIDS (USCG)	$40.0	$0.0	$0.0	$0.0	$40.0
FEDERAL COST OF GNF	$3,851.1	$191.0	$134.0	$2,719.4	$806.6
NON-FEDERAL COST OF GNF	423.5	0.0	0.0	302.2	121.3
NON-FEDERAL COST (LERRD)					
Bulkhead/Pier Replacements	$8,317.0	$0.0	$0.0	$8,317.0	$0.0
Utility Relocations	370.4	0.0	0.0	370.4	0.0
Upland Disposal Area Costs:					
Land Acquisition	515.0	0.0	0.0	515.0	0.0
Diking & Site Preparation	401.7	0.0	0.0	401.7	0.0
Road Relocation	150.0	0.0	0.0	150.0	0.0
ENGINEERING & DESIGN	466.9	0.0	274.8	192.1	0.0
SUPERVISION & ADMINISTRATION	576.6	0.0	192.4	384.2	0.0
TOTAL NON-FEDERAL COST (LERRD)	$10,797.5	$0.0	$467.2	$10,330.3	$0.0
TOTAL PROJECT FIRST COSTS	$15,072.0	$191.0	$601.2	$13,351.9	$927.9
FEDERAL	3,851.0	191.0	134.0	2,719.4	806.6
NON-FEDERAL	11,221.0	0.0	467.2	10,632.5	121.3

Note: Costs include 20% contingencies. These costs represent the financial costs for project construction and do not contain other costs used in the economic formulation of the project.

TABLE XXVI
FIRST COSTS AND EXPENDITURE SCHEDULE
FEDERAL AND NON-FEDERAL FIRST COSTS
(Costs Indexed For Inflation)

ITEM	TOTAL COST ($1,000)	F.Y. 1989	F.Y. 1990	F.Y. 1991	F.Y. 1992
GENERAL NAVIGATION FEATURES (GNF)					
CHANNELS AND CANALS:					
CONTRACT 1:					
GIWW Segment (536+00 to 1185+45)	$915.2	$0.0	$0.0	$915.2	$0.0
Sound Channel Segment (130+00 to 536+00)	2,459.5	0.0	0.0	2,459.5	0.0
Dredged Material Stabilization at Isle aux Herbes	46.4	0.0	0.0	46.4	0.0
CONTRACT 2:					
Bayou Channel to Turning Basin (130+00 to 30+00)	649.8	0.0	0.0	0.0	649.8
Bayou Channel Above Turning Basin (30+00 to -15+55)	263.5	0.0	0.0	0.0	263.5
Snake Bayou Channel (0+00 to 13+47)	118.3	0.0	0.0	0.0	118.3
ENGINEERING & DESIGN	418.9	170.0	137.5	82.0	29.4
SUPERVISION & ADMINISTRATION	173.9	21.0	9.9	92.6	50.4
TOTAL GENERAL NAVIGATION FEATURES	$5,045.6	$191.0	$147.4	$3,595.7	$1,111.4
NAVIGATION AIDS (USCG)	$48.8	$0.0	$0.0	$0.0	$48.8
FEDERAL COST OF GNF	$4,589.8	$191.0	$147.4	$3,236.2	$1,015.2
NON-FEDERAL COST OF GNF	504.6	0.0	0.0	359.6	145.0
NON-FEDERAL COST (LERRD)					
Bulkhead/Pier Replacements	$9,647.7	$0.0	$0.0	$9,647.7	$0.0
Utility Relocations	429.7	0.0	0.0	429.7	0.0
Upland Disposal Area Costs:					
Land Acquisition	597.4	0.0	0.0	597.4	0.0
Diking & Site Preparation	466.1	0.0	0.0	466.1	0.0
Road Relocation	174.0	0.0	0.0	174.0	0.0
ENGINEERING & DESIGN	577.1	0.0	302.3	274.8	0.0
SUPERVISION & ADMINISTRATION	657.2	0.0	211.6	445.6	0.0
TOTAL NON-FEDERAL COST (LERRD)	$12,549.2	$0.0	$513.9	$12,035.3	$0.0
TOTAL PROJECT FIRST COSTS	$17,643.6	$191.0	$661.3	$15,631.1	$1,160.2
FEDERAL	4,589.8	191.0	147.4	3,236.2	1,015.2
NON-FEDERAL	13,053.8	0.0	513.9	12,394.9	145.0

Note: These costs are indexed from October 1988 (F.Y. 89) price levels. The multipliers used were 1.10, 1.19 and 1.22 for F.Y. 1990, F.Y. 1991 AND F.Y. 1992, respectively.

TABLE XXVII
PRECONSTRUCTION ENGINEERING AND DESIGN ESTIMATE
GENERAL NAVIGATION FEATURES

ITEM	ESTIMATED COST
GENERAL DESIGN MEMORANDUM (GDM)	
Public Involvement	$ 5,100
Cultural Resources	30,400
Environmental	30,400
Economic	10,000
Surveying and Mapping	25,200
Geotechnical	56,400
Design and Cost Estimates	15,200
Study Management	30,400
Hydrology and Hydraulics	20,200
Report Preparation	10,100
Fish and Wildlife	5,100
Real Estate	5,100
Supervision and Administration	40,500
Subtotal GDM	$284,200
PLANS AND SPECIFICATIONS (P&S)	
Plans and Specifications	$ 35,700
Supervision and Administration	5,100
Subtotal P&S	40,800
TOTAL PRECONSTRUCTION ENGINEERING AND DESIGN (PED)	$325,000

Provision of an 18-foot deep channel would impact 360 acres of bottoms within Mississippi Sound; however, 100 of these acres are currently disturbed every three years during the maintenance of the existing project. These bottoms range in depth from 12 to over 18 feet MLW and are characterized as open sound, muddy sands. This habitat type makes up approximately 50 percent of the benthic habitat of the study area. Dredging within the Mississippi Sound segment would convert bottoms which are currently 12 to 18 feet deep to a depth of 20 feet, with advance maintenance and overdepth dredging. Dredging in the area of the GIWW segment would not appreciably change the depth of the bottoms since existing depths in the area range from 18 feet and deeper.

Disposal of construction material from the Sound and GIWW channel segments in water greater than 12 feet deep would impact a total of approximately 600 acres of estuarine bottoms within

Mississippi Sound which are characterized as open sound, muddy sands. These potentially impacted bottoms are located approximately 2500 feet west of the Sound channel segment and 5000 feet south of the proposed GIWW channel segment. Depths in these areas are not expected to decrease by more than two feet; however, breaks would be provided between disposal areas so that no levee effect would be created. Approximately 500 acres of these bottoms would be impacted on a 3-year cycle during maintenance dredging. Disposal would result in an initial lift of one foot or less and it is expected that the majority of this material would be dispersed throughout this area of Mississippi sound between maintenance cycles so that no long term shallowing of the area is expected. Long term impacts to benthic resources are not expected to occur since studies have shown repopulation to occur within 18 months under normal operations and within as little as 6 weeks following thin layer placement.

No submerged grassbeds, oyster reefs, or endangered or threatened species would be impacted with implementation of this plan. This plan, although increasing efficiencies associated with the commercial fishing industry, is not expected to impact fishery resources within the Gulf of Mexico due to existing regulations promulgated by the Gulf of Mexico Fishery Management Council and state agencies. Fishery resources within the Mississippi Sound would not be significantly affected by the proposed action since no known nursery or spawning areas would be impacted. Additionally, most adult fishery species are motile enough to avoid areas of dredging and disposal.

Wildlife resources utilizing the proposed upland disposal area "Delta" would be displaced from the 107 acres. Intensive management activities at the disposal areas would preclude total reuse of the area by wildlife. Any species utilizing the existing disposal area "Charlie" and those which would utilize "Delta" would be disrupted on a 3-year cycle during maintenance of the project. The value of the proposed upland disposal area for wildlife, however, is not significant and the Fish and Wildlife Service has concurred that any impacts to wildlife are acceptable.

Implementation of this plan would not be expected to impact air or water quality, circulation patterns, or ground water resources. No known contaminants are present within the materials to be disposed which would result in toxic effects on organisms within Mississippi Sound.

No impacts would result to historic or archeological resources. As a result of consultations with the Alabama State Historic Preservation Officer, it was determined that the proposed new upland disposal area should be surveyed for cultural resources. The survey was conducted by Mobile District archeologists on September 2, 1988. No archeological sites or historic structures were identified. The negative report of these investigations has been concurred in by the Alabama Historic Preservation Officer and the National Park Service.

Conflicts with the management plan of the Gulf Islands National Seashore or the Coastal Barrier Resources Act would not occur as a result of the implementation of the tentatively selected plan. Significant input to the economy of Bayou la Batre, Mobile County and the State of Alabama would tend to enhance the quality of life for the residents of the area and the economic benefits for the nation.

Environmental impacts due to the repair, rehabilitation or replacement of existing bulkheads and piers along the bayou would be minimal. Construction of new bulkheads as required for property protection would impact approximately 2,000 feet of shoreline. Impacts associated with this action would result primarily from dredging shallow water bottoms and associated short term increases in turbidity.

Currently undeveloped areas adjacent to the bayou could be impacted by water dependent development induced by the improved project. Such development, however, could occur with or without the project. Approximately 6.8 acres of wetlands along the east bank below Station 108+00; 0.4 acre of wetlands along the west bank above Station 106+75, including Snake Bayou; and 5.9 and 7 acres of wetlands and shallow water bottoms, respectively, on the west bank below Station 106+75 are expected to come under development pressure within the life of the project. Development of these areas, either through dredging or filling, would require individual Department of the Army permits. Other areas along the bayou have been exempted from development consideration at this time. These impacts are discussed in detail in the Environmental Impact Statement within this report.

Section 906(d) of the Water Resources Development Act of 1986 states, *"After the date of enactment of this Act, the Secretary shall not submit any proposal for the authorization of any water resources project to the Congress unless such report contains (1) a recommendation with a specific plan to mitigate fish and wildlife losses created by such project, or (2) a determination by the Secretary that such project will have negligible adverse impact on fish and wildlife."*

Throughout the planning for the navigation improvements for Bayou La Batre, efforts have been made to incorporate mitigation, as defined by the CEQ's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA), into the project. As a result of past coordination efforts with the Federal and state environmental agencies in which they stressed the importance of shallow estuarine bottoms to the productivity of the estuarine system, serious consideration was given to restricting open water disposal to waters greater than 12 feet in depth. This is supported by studies performed during the Mississippi Sound and Adjacent Areas Study and post disposal operations at other projects. Areas characterized by depths of less than 12 feet are highly productive in nature and in the vicinity of Bayou La Batre are extensively used by fish and shellfish as nursery and feeding areas. Studies have also shown that the placement of new work material in shallow waters results in mounding which subsequently causes changes in circulation and water quality. In addition, plans were developed which maximized the use of upland disposal areas for both new work and maintenance materials. These plans call for the use of intensive management techniques to increase the life of the upland disposal areas while at the same time minimizing the acreage required. Beneficial use of the new work dredged material was also considered a high priority during the formulation process.

As a result of these efforts, impacts to significant resources due to the recommended plan have been minimized through planning and avoidance and no additional mitigation is proposed.

Section 150 of the Water Resources Development Act of 1976 requires that the use of dredged material to create wetlands be considered during project planning. Use of dredged material for wetland creation under Section 150 was considered, however, the berm to be constructed will not be a permanent structure therefore the permanence of the wetlands which would be constructed can not be quaranteed. If modifications are made during Preconstruction Engineering and Design additional consideration will be made relative to the use of Section 150 for creation of wetlands.

VI. PLAN IMPLEMENTATION.

A. General. This section of the report describes the cost allocation for the project as well as cost apportionment and responsibilities of the Federal and non-Federal interests for construction and maintenance of the recommended plan. Cost apportionment and responsibilities described herein are consistent with those specified in the Water Resources Development Act of 1986 (P.L. 99-662, 99th Congress). The costs discussed in this section of the report are October 1988 price level

B. Cost Allocation. All plans considered for the Bayou La Batre project were single purpose navigation. Therefore, all costs are allocated to navigation.

C. Cost Apportionment. Legislation authorizing implementation of water resource projects, the most recent being the Water Resources Development Act of 1986 (WRDA of 1986), generally contains local cooperation and cost sharing requirements. This report describes the local cooperation and cost sharing requirements contained in the WRDA of 1986 and the effect of these requirements on apportionment of the total $17,692,000 first costs for implementation of the recommended plan at Bayou La Batre. Estimates of Federal and non-Federal maintenance costs over the 50-year life of the project are also provided.

1. Federal Costs. The Federal costs associated with implementation of the recommended plan at Bayou La Batre shall be 90 percent of the cost to design and construct the general navigation features of the project (100 percent of aids to navigation) and 100 percent of the cost to maintain those features over the 50-year life of the project. The estimated Federal share of the cost of the general navigation features of the project, including aids to navigation, is $4,639,000. The general navigation features of the Bayou La Batre project consist of dredged material excavation and aids to navigation.

The total cost of maintaining the general navigation features over the 50-year project life is estimated to be $15,800,000, based on a 3-year maintenance cycle at $983,000 per cycle. These maintenance costs are for dredged material excavation within the channel.

2. Non-Federal Costs. The non-Federal first costs of construction and 50-year maintenance costs, associated with implementation of the recommended plan at Bayou La Batre are as follows.

a. General Navigation Features. The non-Federal sponsor shall pay in cash, during the period of construction of the project, 10 percent of the cost associated with the general navigation features not including aids to navigation. The estimated non-Federal share of the general navigation features at Bayou La Batre is $505,000. In addition, the non-Federal sponsor shall pay an additional 10 percent of the cost of the general navigation features of the project in cash over a period not to exceed 30 years, at an interest rate determined pursuant to section 106 of the WRDA of 1986. The value of lands, easements, rights-of-way, relocations (except utility relocations) and dredged material disposal areas shall be credited toward this required payment. The estimated costs of lands, diking and site preparation for upland disposal areas associated with the recommended plan at Bayou La Batre is expected to offset this payment.

b. Lands, Easements, Rights-of-Way, Relocations, Replacements, Dredged Material Disposal Areas. The non-Federal sponsor shall provide 100 percent of the costs for lands, easements, rights-of-way, relocations, replacements and dredged material disposal areas. In addition, the design and administrative costs associated with providing these features of the project shall be the responsibility of the non-Federal sponsor. The total estimated first costs for these items, including design and administrative costs, at Bayou La Batre is $12,549,000. These costs include bulkhead/pier replacements, utility relocations, and the provision of upland dredged material disposal areas. The costs for upland disposal areas include land acquisition costs, road relocation, diking and site preparation.

c. Maintenance Costs. The non-Federal responsibility for maintenance of the project include the costs of diking and site preparation and management of upland disposal areas. These costs are estimated at $115,000 per 3-year maintenance cycle or a total of $1,840,000 over the 50-year life of the project.

D. Responsibilities.

1. Federal. The Federal Government would design and prepare detailed plans, construct, and share in the cost of the general navigation features of the project as previously described. Construction would be contingent upon Congressional authorization and funding and upon receipt of the non-Federal assurances and cost items.

2. Non-Federal. Formal assurances of non-Federal cooperation must be furnished prior to project construction. The non-Federal sponsor must agree to:

a. Provide, without cost to the United States, all lands, easements and rights-of-way necessary for construction and maintenance of the project upon the request of the Chief of Engineers, including suitable areas determined by the Chief of Engineers to be required in the general public interest for initial and subsequent disposal of dredged material.

b. Hold and save the United States free from damages due to the construction and maintenance of the project, except damages due to the fault or negligence of the United States or its contractors.

c. Perform and assure the performance of existing bulkhead replacements within the project as required due to a deepened channel and to otherwise protect or acquire interest in adjacent properties impacted by the project.

d. Accomplish without cost to the United States all lands, easements, right-of-way, relocations, replacements, berthing areas and dredged material disposal areas necessary for project purposes.

e. Fulfill all other requirements of non-Federal sponsorship as specified by the WRDA of 1986 or other applicable statutes and requirements.

RECOMMENDATIONS

It is recommended that the existing Federal navigation project for Bayou La Batre, Alabama, be improved with such modifications thereof as in the discretion of the Commander, USACE, may be advisable, to provide for:

Deepening the existing Federal channel within Bayou La Batre to a navigation depth of 18 feet by 100 feet wide from the mouth of Bayou La Batre (130+00) to and including the existing turning basin (30+00).

Deepening the existing Federal channel within Bayou La Batre to a navigation depth of 14 feet by 75 feet wide from the turning basin (30+00) to the Highway 188 bridge crossing (0+00).

Extending a 14-foot by 75-foot channel from the Highway 188 bridge crossing within Bayou La Batre to Sta. -15+10 above the bridge.

Extending a 14-foot by 50-foot channel from the turning basin into Snake Bayou to Sta. 5+33, then a 12-foot by 50-foot channel within Snake Bayou to Sta. 13+47.

Extending and widening the existing 12-foot by 100-foot Federal channel within Mississippi Sound to connect with the Gulf Intracoastal Waterway (GIWW) alignment (536+00) then westward along the GIWW alignment to connect with the existing Pascagoula Ship Channel (1185+45). The recommended dimensions of this channel are 18 feet in depth by 120 feet in width.

This recommendation is made with the provision that, prior to the commencement of construction, the non-Federal sponsor will comply with all requirements of law concerning non-Federal sponsorship of the project.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and/or implementation funding.

GARRY V. COOPER
LTC, Corps of Engineers
Acting District Engineer

APPENDIX A

PUBLIC INVOLVEMENT AND LOCAL COOPERATION

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APPENDIX A

PUBLIC INVOLVEMENT AND LOCAL COOPERATION

1. This appendix discusses the coordination and public involvement which went into the preparation of the study. Following this narrative are reproductions of the local cooperation agreement, and letters of comment from the general public. Coordination letters from agencies, with responses as appropriate, have been included in either the Environmental Impact Statement (EIS) or the Environmental Documentation (ED) Appendix.

STUDY PARTICIPANTS AND COORDINATION

2. The Corps of Engineers was responsible for the overall conduct and coordination of the study, consolidation of information from other agencies, formulation of plans, and preparation of the report. At the District level, a multidisciplinary team was used to conduct the study and prepare the report. Early in the study, coordination was primarily with the sponsor to determine local problems and needs. A study cost sharing agreement was negotiated with the City of Bayou La Batre in May 1985 and submitted with the reconnaissance report. The reconnaissance report was approved for initiation of the feasibility study in September 1985, prior to the decision by the Secretary of the Army to proceed with cost sharing. That decision was made in March 1986 and an escrow agreement for the local share of the funds was negotiated and finalized in May 1986. A copy of that agreement is enclosed.

3. A scoping letter was prepared in April 1987 and sent to the Alabama Department of Environmental Management, Alabama Department of Conservation and Natural Resources, National Marine Fisheries Service, Fish and Wildlife Service, Alabama Wildlife Federation, US Environmental Protection Agency, Marine Environmental Sciences Consortium, Sea Grant Advisor Service, Mobile Bay Audubon Society, Metcalf, Ball & Assoc., City of Bayou La Batre, Gulf of Mexico Fishery Management Council, Departments of Sociology & Anthropology and Economics & Finance, University of South Alabama, Master Marine, Inc., and Messrs. Sam J. Kayser, Jr. and Art Dyas. A copy of that letter, with responses and other agency comments, is included in the ED Appendix.

PUBLIC MEETINGS

4. Because the feasibility study was initiated rather quickly after the completion of the reconnaissance report, it was not considered necessary to conduct an initial public meeting for the feasibility study. Close coordination with the City of Bayou La Batre and other local interests was maintained throughout the feasibility phase.

ESCROW AGREEMENT

This ESCROW AGREEMENT made this 31 day of May, 19 86 by and between the CITY OF BAYOU LA BATRE, ALABAMA, (hereinafter referred to as the "Local Interest"), and THE FIRST ALABAMA BANK, MOBILE, ALABAMA, a banking institution organized under the laws of Alabama (hereinafter referred to as the "Escrow Agent"), and THE UNITED STATES OF AMERICA (hereinafter referred to as the "Government"), represented by the District Engineer, Mobile District, Corps of Engineers, U. S. Army, Mobile, Alabama.

WITNESSETH:

WHEREAS, the Feasibility Phase Study to investigate channel improvements at Bayou La Batre, Alabama, hereinafter called the "Study", was authorized by a United States House of Representatives Public Works Committee resolution, adopted October 10, 1974; and, funds being appropriated for the Government's Fiscal Year 1986 share of said Study under the Energy and Water Development Appropriation Act for 1986 (Public Law 99-141), and

WHEREAS, the Local Interest, pursuant to certain assurances evidenced by the formal agreement entered into with the Government on 21 May 1985, which is incorporated herein by reference and a copy set forth as Exhibit "A" hereto, has agreed to contribute such funds as are required of Local Interest in connection with the Feasibility Phase Study to investigate channel improvements at Bayou La Batre, Alabama, and

WHEREAS, the Local Interest is desirous of contributing such funds to the Government, the Local Interest's share, based on a Feasibility Phase Study investigating a 14 to 16 foot channel, being currently estimated at $171,500.00, in periodic installments over the period of the Feasibility Phase Study which is a permissible procedure under the provisions of the referenced agreement between the Local Interest and the Government dated 21 May 1985; and

WHEREAS, such periodic installments will be used by the Government in accordance with the referenced agreement dated May 21, 1985 and set forth as Exhibit "A" hereto, and

WHEREAS, the cost attributable to the Local Interest during the ensuing fiscal year 1986 is estimated at $60,000.00, and

WHEREAS, the interest income on this amount of money for the Fiscal Year 1986, as well as sums of money required of the Local Interest during ensuing fiscal years of the Feasibility Phase Study, will be substantial and would be lost by the Local Interest; and

WHEREAS, an escrow agreement will permit the Local Interest to earn such interest income and will also allow the Government to complete the Feasibility Phase Study, subject to the availability of federal funds; and

WHEREAS, it will be necessary that this agreement be renewed or extended to cover fiscal periods subsequent to and including Fiscal Year 1986; and

WHEREAS, it is the desire of the parties hereto to establish an escrow account which will provide for contributions to be made therefrom on account of the Local Interest.

NOW THEREFORE, IT IS HEREBY MUTUALLY AGREED BY AND BETWEEN THE PARTIES AS FOLLOWS:

1. There is hereby created and established with the Escrow Agent an escrow fund pursuant to the terms of this Agreement. The Local Interest will make absolute and irrevocable delivery of an initial sum of money to be determined by the Government to the escrow fund and will deposit under similar conditions such sums of money as are projected by the Government for the succeeding fiscal years during the term of this Agreement, such sums to be deposited prior to 1 October of each succeeding fiscal year.

2. The Local Interest agrees to add to the said deposited sums additional sums if required to meet the Local Interest's share of funds during any particular fiscal year pursuant to the obligation assumed under the aforementioned Local Cooperation Agreement dated 21 May 1985 between the Government and the Local Interest.

3. The Escrow Agent is hereby directed to disburse the said escrow fund to only the District Engineer of the U. S. Army Engineer District, Mobile, Alabama, for the purpose of said Study on demand of the Government as evidenced by written demand of the District Engineer, U. S. Army Engineer District, Mobile, Alabama; with the approval of the Local Interest endorsed thereon.

4. Each requisition for disbursement from this Escrow Fund shall specify:

a. That the disbursement is for proper obligations of the Study expenses and has not heretofore been included in a former requisition; and

b. Amount to be paid.

5. The Government will provide the Local Interest the opportunity to review the basis for all payments to be made from the escrow fund prior to payments being made by the Escrow Agent, provided such review does not delay orderly payments by the Escrow Agent to the Government or award of contract or payments by the Government to its contractors.

6. All payments made by the Escrow Agent shall be drawn to the Finance and Accounting Officer, USA, Corps of Engineers, P. O. Box 2288, Mobile, Alabama 36628-0001.

7. The Escrow Agent shall keep and maintain adequate records pertaining to the escrow fund, and all disbursements therefrom. When the escrow fund has been closed out as provided by paragraph 8 hereof, the Escrow Agent shall file an accounting thereof with both the Government and the Local Interest.

8. Completion or discontinuance of the Study shall be evidenced by filing with the Escrow Agent a certificate signed by the District Engineer, U. S. Army Corps of Engineers, Mobile, Alabama, with the approval of the Local Interest endorsed thereon, which certificate shall set forth the date of completion or abandonment of the Study and that all obligations and costs in connection with the Study, and payable out of the escrow fund, have been paid and discharged. Any balance remaining in the fund shall be remitted to the Local Interest.

9. Monies held for credit of the escrow fund under this Agreement may be kept invested and reinvested by the Escrow Agent in direct obligations of the United States Government or in obligations of Federal Agencies; or, monies may be deposited in interest bearing accounts or in interest bearing Certificates of Deposit with the Escrow Agent to provide for the payment of requisitions for disbursement. Obligations so purchased as an investment shall be held by or under the control of the Escrow Agent and shall be deemed at all times a part of the escrow fund, and interest accruing thereon shall be credited to such escrow fund.

10. The Escrow Agent shall invest any and all cash funds which are not, in its judgment, under present demand, and if upon requisition from the Government, sufficient cash funds do not remain on hand, the Escrow Agent is directed to sell and reduce to cash funds, sufficient amounts of such investments to pay a requisition when presented; and, in any event, shall pay the requisition within ten days after presentation of the requisition for payment.

11. The Escrow Agent shall receive an agreed upon sum annually for its services as Escrow Agent, which shall be paid by the Local Interest. Such payment can be recovered by the Escrow Agent by deducting the necessary amount from the interest accrued on the obligation, or if such accrual is insufficient, by submitting its claim for services to the Local Interest. PROVIDED, HOWEVER, that it is understood and agreed that the Escrow Agent does not have the right to deduct any monies of the principal sum for such services and that any claim for escrow agent services cost which cannot be satisfied from accrued interest must be recovered directly from the Local Interest.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement the day and year first above written.

CITY OF BAYOU LA BATRE, ALABAMA

WITNESS

THE FIRST ALABAMA BANK, MOBILE, ALABAMA

BY:

WITNESS

UNITED STATES OF AMERICA
U. S. ARMY CORPS OF ENGINEERS,
MOBILE DISTRICT

BY:

WITNESS

US Army Corps of Engineers
Mobile District

PUBLIC MEETING ANNOUNCMENT

A PUBLIC MEETING WILL BE CONDUCTED BY THE MOBILE DISTRICT, U.S. ARMY CORPS OF ENGINEERS TO GAIN PUBLIC INPUT AND TO PRESENT THE RESULTS OF THE DRAFT FEASIBILITY REPORT FOR MODIFICATION OF THE EXISTING FEDERAL CHANNEL AT BAYOU LA BATRE, ALABAMA.

WHEN: AUGUST 24, 1988
7:00 PM

WHERE: BAYOU LA BATRE COMMUNITY CENTER

WHO: ALL INTERESTED PARTIES

SEE ATTACHED SHEETS FOR ADDITIONAL INFORMATION

DEPARTMENT OF THE ARMY
MOBILE DISTRICT. CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE. ALABAMA 36628-0001

July 28, 1988

REPLY TO
ATTENTION OF:

Coastal Section

NOTICE OF PUBLIC MEETING
AND
PUBLIC INFORMATION BROCHURE

The Mobile District, US Army Corps of Engineers has completed a draft feasibility report and environmental impact statement for deepening and extending the existing Federal navigation project at Bayou La Batre, Alabama. This public meeting is being conducted to present the results of the study and to receive comments from the general public concerning the project.

All interested persons and organizations are invited to attend and participate in the meeting. It is requested that, where possible, important facts or statements regarding the study be submitted in writing for accuracy of record. Written statements may be submitted at the meeting or mailed to the Mobile District in advance. Oral statements made at the meeting will be recorded and made a part of the official record.

The public meeting will be held on:

Wednesday, August 24, 1988
7:00 P.M.
at
Bayou La Batre Community Center
Bayou La Batre, Alabama

We welcome your comments at the meeting; however, if you cannot attend and/or wish to make a written statement in advance, such correspondence should be directed to the District Engineer, US Army Corps of Engineers, Mobile District, ATTN: CESAM-PD-FC, P.O. Box 2288, Mobile, Alabama 36628-0001.

STUDY AUTHORITY

The Bayou La Batre Feasibility Study was authorized by a United States House of Representatives Public Works Committee resolution adopted October 10, 1974. This resolution reads in part:

> "The Board of Engineers for Rivers and Harbors is requested to review the report on Bayou La Batre (House Document 327, 88th Congress, 2nd Session) and other pertinent reports with a view to determining the advisability of modifying the existing project in any way at this time."

EXISTING PROJECT

The existing Federal navigation project at Bayou la Batre, completed in March 1967, consists of a 12' x 100' channel extending from the 12-foot depth contour in Mississippi Sound to a turning basin within the bayou located about 3000 feet downstream of the Highway 188 bridge. From the turning basin, a 12' x 75' channel extends upstream to the Highway 188 bridge. The total length of the existing Federal project is approximately 6.3 miles.

PURPOSE OF THE STUDY

The purpose of the Bayou La Batre Feasibility Study is to investigate the potential for deepening, widening and extending the existing Federal channel and to identify the plan which maximizes net national economic benefits while complying with all environmental laws and regulations.

PLAN FORMULATION

An array of alternative plans were developed for the Bayou La Batre project which included various combinations of channel depths and alignments. These plans included deepening the existing project from the head of the turning basin downstream through the bayou and into Mississippi Sound to alternative depths of 14 feet through 22 feet, alternative alignments through Petit Bois Pass or along the Gulf Intracoastal Waterway, extending a 14' x 75' channel approximately 1500 feet above the Highway 188 bridge, and providing a 12' x 50' channel approximately 1300 feet into Snake Bayou. In conjunction with these alternative channel segments and depths, a number of construction and maintenance dredged material disposal measures were evaluated. Cost estimates were developed for each alternative in order to determine economic feasibility of the project and to identify the plan which maximized National Economic Development (NED) benefits. In addition to maximizing NED benefits, the NED plan is that plan which is in compliance with national environmental statutes, applicable executive orders, and other Federal planning requirements.

TENTATIVELY SELECTED PLAN

Based upon the economic, engineering and environmental analyses of alternative plans evaluated for the Bayou La Batre Feasibility Study, the following generally describes the features of the tentatively selected plan for the project.

- Deepening the existing Federal channel from the mouth of Bayou La Batre to the turning basin to a navigation depth of 18 feet.

- Deepening the existing Federal channel from the turning basin to the Highway 188 bridge to a navigation depth of 14 feet.

- Extending a 14' x 75' channel from the Highway 188 bridge to approximately 1500 feet upstream of the bridge.

- Extending a 14' x 50' channel approximately 500 feet into Snake Bayou, thence a 12' x 50' channel to a point approximately 1300 feet into Snake Bayou.

- Deepening, widening and extending the existing Federal channel within Mississippi Sound south to the Gulf Intracoastal Waterway (GIWW) then westward along the GIWW alignment to the Pascagoula Ship Channel. The dimensions of this channel segment would be an 18-foot navigation depth by a 120-foot width.

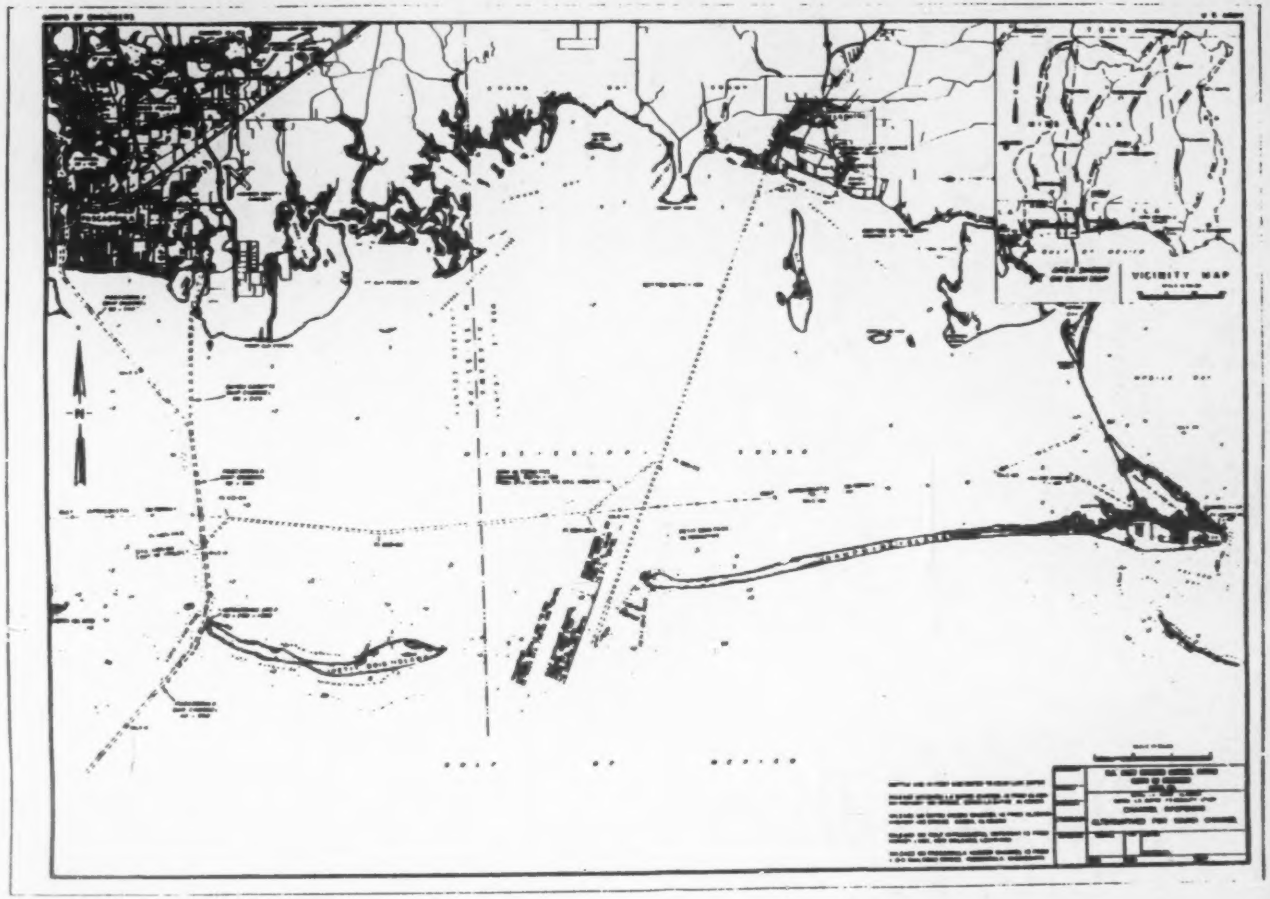
- Construction and maintenance dredged material disposal for this plan would be a combination of upland, island nourishment at Isle aux Herbes (Coffee Island) and open water disposal within Mississippi Sound at depths greater than 12 feet.

The net NED benefits for the tentatively selected plan total $2,613,900 annually with a benefit/cost ratio of 2.2 to 1.

The estimated first costs for construction of the tentatively selected plan are:

FIRST COSTS
TENTATIVELY SELECTED PLAN
($1,000)

	Federal	Non-Federal	Total
LERRD			
Bulkhead/Pier Replacement	$ 0	$23,918.7	$23,918.7
Utility Relocations	0	308.7	308.7
Lands, Diking, Site Prep.	0	901.4	901.4
Berthing Area Dredging	0	138.5	138.5
General Navigation Features			
Channel Dredging	$2,488.7	$ 276.5	$ 2,765.2
Aids to Navigation	36.0	4.0	40.0
Subtotals	$2,524.7	$25,547.8	$28,072.5
E&D	129.3	1,269.7	1,399.0
S&A	90.4	899.1	979.5
Totals	$2,744.4	$27,706.6	$30,451.0


VICINITY MAP
GULF OF MEXICO

PUBLIC MEETING
BAYOU LA BATRE, ALABAMA
FEASIBILITY STUDY

SUMMARY

A public meeting concerning the draft feasibility report and environmental impact statement was conducted in Bayou La Batre, Alabama at 7 P.M. on August 24, 1988. The meeting was attended by 49 persons plus representatives of the Mobile District study team. The purposes of the meeting were to present the results of the study and to receive comments from all interested parties concerning the project. The following is a summary of the questions and statements made at the meeting and, where appropriate, our responses.

- Several years ago, the State of Alabama pledged a total of $7.5 million toward channel improvements at Bayou La Batre. This money represented one half the estimated cost, based upon a private engineering study funded by interest along the bayou, of deepening the channel to 20 feet. This money, to be paid by the Federal Government, was to come from a portion of the state's share of royalties, leases, sales of land, severence taxes, etc., associated with oil and gas activity within the coastal waters of Alabama. By (Federal) law, these monies must go into a trust fund within the state and only the interest is available for use. There was, however, a proposed amendment for the Federal legislation that would allow a one time use of $7.5 million for channel improvements at Bayou La Batre. The proposed ammendment did not pass and, therefore, the money had to go into the trust fund.

- We are confused by the various costs shown in the report pertaining to bulkhead replacements. What will be the cost of bulkhead replacements at Bayou La Batre from the deepened channel?

  RESPONSE: The draft feasibility report contains both financial and economic costs for bulkhead replacements. The financial costs for bulkhead replacements contained those existing bulkheads that are expected to be replaced due to the effects of a deepened channel and those required for property protection. These costs are estimated at $8.3 million (October 1988 Price Level) for the 18-foot channel and represent the cost of bulkhead replacements for project construction. The economic costs for bulkhead replacements, used to test for economic feasibility of the project, contained those financial costs plus an additional quantity of bulkheads potentially replaced due to berthing area deepening. These costs totaled $21.1 million for the 18-foot channel. The rationale for including these additional replacement costs for plan formulation purposes is that, after the channel is deepened, certain individuals would deepen berthing areas in order to utilize the deeper channel. We have no way of knowing precisely who may deepen berthing area or when these deepenings may occur; therefore, we made certain assumptions concerning the locations of potentially deepened berthing areas and the effects on existing bulkheads.

- At what proposed channel depth do you begin to affect existing bulkheads with the bayou?

  RESPONSE: Existing bulkheads are affected at all channel depths, 14 through 22 feet, investigated for the study. The level of impact increases, however, with greater channel depth.

- Would everybody along the channel have to have a new bulkhead before the Corps of Engineers would dredge?

  RESPONSE: No. The Corps of Engineers will not specify which individual bulkhead will require replacement. That will be the responsibility of the non-Federal sponsor to determine which bulkheads may fail due to channel deepening obstruct the channel or cause damage to property or development. The Corps of Engineers will require that the non-Federal sponsor hold and save the Federal Government free from damages due to bulkhead failure during project construction except through negligence on the part of the Federal Government or its contractors.

- Would persons have a choice as to whether they would replace their bulkhead or not?

  RESPONSE· Not necessarily. If a bulkhead will obviously fail due to deepening and obstruct the channel, the owner will have no choice but to replace the bulkhead. Again, those determinations of which bulkheads will be replaced and who will bear the cost will be the responsibility of the non-Federal sponsor.

- We met with State Finance Director last week to discuss state sponsorship and financial assistance for the project and the development of a draft financing plan. The State Finance Director currently has his staff working on the financing plan for Bayou La Batre but, due to the special legislative session, he does not expect to be able to complete this plan until after September 1988.

- When would the non-Federal funds be required?

  RESPONSE: Assuming successful implementation of the new Washington level review procedure for this project, expeditious authorization and funding, and fulfillment of the non-Federal sponsorship requirements, project construction could begin within a late 1991 or early 1992 timeframe. The non-Federal sponsor would perform or furnish lands, easements, rights-of-way, bulkhead replacements and dredged material disposal areas during the first year of construction plus provide a cash contribution for the non-Federal share of the construction, engineering and design of the general navigation features of the project. This cash contribution is currently estimated at a total of $504,600. Of this amount, $359,600 would be required during Fiscal Year 1991 and the remaining $145,000 required during Fiscal Year 1992, based upon the expected construction schedule and expenditures for project construction.

- Does the Corps have a problem with extending the date for when a draft financing plan could be furnished?

  RESPONSE: No, although we would like to obtain one at the earliest possible date. It is also important that the non-Federal sponsor submit a plan that contains as much certainty as possible in regard to amounts and sources of non-Federal revenue for the project.

- The state wants to know what individuals along the bayou as well as the city may do financially as part of the project. What we might expect to see as part of a financing plan would be financial participation on the part of individual owners, the City of Bayou La Batre and the State Of Alabama.

- Is the existing upland disposal area "Charlie" adequate for the project?

  RESPONSE: No. The quantities of construction and maintenance dredged material required to be disposed in upland sites for the 50-year life of the project necessitate the acquisition of an additional upland disposal site. The required size of this new area for an 18-foot deep channel is 107 acres.

- The issue of obtaining permits to replace bulkheads or to build new bulkheads along the bayou is of great concern to us. What will we have to do?

  RESPONSE: The permitting for those existing bulkheads to be replaced and for those identified to be added for property protection as part of project construction have been taken care of as part of this report. You would go to the Corps of Engineers and request a letter of permission to replace an existing bulkhead or to build a new bulkhead in those locations identified as part of this study. You would not have to go through the permit application process or have discussion with any other agencies relative to those bulkheads required as part of project construction. Any further development along the bayou, however, would still go through the normal permitting process.

- Does the study address permitting for any other type of development other than bulkheads along the bayou?

  RESPONSE: Some potential future development is addressed in this study, however, we do not know all of the details that individuals might have concerning future development along the bayou. Without those details, we could not include all potential future development in this study relative to the permitting issue.

- Today we had to have a diver go down and remove debris from the wheel of our butterfish boat. At the present, the method we are using to preserve the butterfish catch onboard the vessel is to place the fish in refigerated sea inside the cargo hold. This entails filling the cargo hold with ice and as you start catching the fish at the usually very rapid rate, they are placed in the refigerated sea water. It is not uncommon for us to catch between 30,000 and 40,000 pounds of butterfish per day. You have to ice them very rapidly by flooding the cargo hold containing the ice with sea water then place the fish in this solution. The reason this is done this way is because butterfish are easily damaged and in order to preserve the catch and maintain the required market quality bringing the best price, they must be preserved in this way. To freeze them in the conventional way and stack them would significantly lower the quality. The boats we use at the present time are large converted shrimp trawlers and because we fill the hold with sea water and catch, we are sinking the boat 3 to 4 feet deeper than normal for this vessel. Because of this, we are having trouble getting into the bayou to unload. We are also having trouble getting our bulk fuel barges into the bayou.

- A petition to close the cut in Coffee Island (Isle aux Herbes) with dredged material was read into the record. The reasons stated to close the cut were:

  - to produce more feeding and nesting areas for waterfowl.

  - to stop erosion of the island.

  - to retain more freshwater within Portersville Bay to help oyster production.

  - to retain the oyster shell from dredged material to help oyster spat.

  - to prevent mud and silt from filling Portersville Bay through the cut.

- I do not want the oyster shells that I have planted off the east end of Coffee Island (Isle aux Herbes) covered with dredged material.

  RESPONSE: This issue has been addressed in the Environmental Impact Statement for the project.

- Remaining comments were in support of the project stating the future economic opportunities that a deepened channel would afford for the

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

May 11, 1988

REPLY TO
ATTENTION OF:

Acquisition Branch

SUBJECT: Draft LCA, Bayou La Batre Navigation Project

Honorable J. F. Nelson, Mayor
City of Bayou La Batre
33 South Wintzell Avenue
Bayou La Batre, Alabama 36529

Dear Mayor Nelson:

Enclosed are six (6) copies of a draft Local Cooperation Agreement for the navigation project at Bayou La Batre, for your and the Councils review. Staff from the Mobile District should contact you within the next few days to set up a meeting to discuss and explain this agreement. In the initerim, if you have any questions, please contact Mr. Joseph Givhan at 690-3295.

Sincerely,

L. E. Lewis, Jr.
Acting Chief, Real Estate Division

LOCAL COOPERATION
AGREEMENT BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE CITY OF BAYOU LA BATRE
FOR CONSTRUCTION OF THE NAVIGATION PROJECT AT
BAYOU LA BATRE, ALABAMA

THIS AGREEMENT entered into this _______ day of _______________, 198___ by and between the DEPARTMENT OF THE ARMY (hereinafter referred to as the "Government") acting by and through the Assistant Secretary of the Army (Civil Works), represented by the District Engineer, U.S. Army Engineer District, Mobile, Alabama and the CITY OF BAYOU LA BATRE (hereinafter referred to as the "City"), acting by and through its Mayor,

WITNESSETH THAT:

WHEREAS, the authority for construction of the navigation project at Bayou La Batre, Alabama (hereinafter called the "Project") not specifically authorized by Congress is contained in Section 201 of the Flood Control Act of 1965, (PL 89-298), as amended; and

WHEREAS, construction of the Project is described in a report entitled ____, prepared by the District Engineer, U. S. Army Engineer District, Mobile Alabama, dated _______________, and approved by the Chief of Engineers, U. S. Army, Washington, D. C., on _________________; and

WHEREAS, the Water Resources Development Act of 1986, Public Law 99-662, specifies the cost-sharing requirements applicable to the Project; and

WHEREAS, the City has the authority and capability to furnish the cooperation hereinafter set forth and is willing to participate in project cost-sharing and financing in accordance with the terms of this Agreement;

NOW, THEREFORE, the parties agree as follows:

ARTICLE I - DEFINITIONS

For purposes of this Agreement:

1. The term "general navigation features of the project" shall mean the following project features assigned to commercial navigation: dredging to a depth of 18 feet below mean low water a channel 100 feet wide beginning in the turning basin in Bayou La Batre at station 30+00 and proceeding down the Bayou to the mouth and station 130+00. From station 130+00 south along the existing alignment of the Bayou La Batre ship channel, dredging to a depth of 18 feet below mean low water a channel 120 feet wide to station 536+00, at the intersection with the Gulf Intercoastal Waterway. Then along the Gulf Intercoastal Waterway alignment continuing the 18-foot by 120-foot channel to the intersection with the Pascagoula Ship Channel at station 1185+45. Within the Bayou a channel would be dredged 14 feet below mean low water and 75 feet wide beginning at station 30+00 and running north to station -15+10. Additionally, from the confluence of Snake Bayou with Bayou La Batre, which occurs at the Bayou La Batre turning basin, a channel would be dredged up Snake Bayou 14 feet below mean low water and 50 feet wide from

station 0+00 to station 5+33. From station 5+33 a channel would be extended up Snake Bayou at a depth of 12 feet below mean high water and 50 feet wide to station 13+47.

2. The term "total cost of construction of general navigation facilities assigned to commercial navigation" shall mean all costs incurred by the City and the Government directly related to construction of the general navigation features of project. Such costs shall include, but not necessarily be limited to, actual construction costs, costs of preparation of contract plans and specifications, costs of relocations not performed by or on behalf of the local sponsor, costs of applicable engineering and design, supervision and administration costs, and costs of contract dispute settlements or awards, but shall not include the value of lands, easements, rights-of-way, and dredged material disposal areas, relocations performed by or on behalf of the local sponsor, non-Federal dredging of public or private channels and berthing areas, aids to navigation, nor Government costs for preauthorization studies.

3. The term "period of construction" shall mean the time from the advertisement of the first construction contract to the time of acceptance of the general navigation features of the project by the Contracting Officer.

4. The term "Contracting Officer" shall mean the District Engineer, U. S. Army Engineer District, Mobile, Alabama, or his designee.

5. The term "highway" shall mean any highway, thoroughfare, roadway, street, or other public road or way.

ARTICLE II - OBLIGATIONS OF PARTIES

a. The Government, subject to and using funds provided by the City and appropriated by the Congress, shall expeditiously construct the general navigation features of the project, (including alterations or relocations of highway and railroad bridges), applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The City shall be afforded the opportunity to review and comment on all contracts, including relevant plans and specifications, prior to the issuance of invitations for bids. The City also shall be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. The Government will consider the views of the City, but award of the contracts and performance of the work thereunder shall be exclusively within the control of the Government.

b. The Government shall operate and maintain the general navigation features of the project.

c. The City shall provide and maintain, at its own expense, all project facilities other than those for general navigation, including dredged depths commensurate with those in related general navigation features in berthing areas and local access channels serving the general navigation features.

d. As further specified in Article III hereof, the City shall provide to the Government all lands, easements, rights-of-way, including dredged material disposal areas, and perform all relocations or alterations of facilities other than utilities governed by paragraph e. below (except relocations or alterations of highway and railroad bridges), determined by the Government to be necessary for construction, operation, or maintenance of the project.

e. As further specified in Article III hereof, the City shall perform or assure performance of all utility relocations or alterations determined by the Government to be necessary for construction, operation, or maintenance of the project.

f. As further specified in Article VI hereof, the City shall provide, during the period of construction, a cash contribution equal to the following percentages of the total cost of construction of the general navigation facilities assigned to commercial navigation:

1. 10 percent of the costs attributable to the portion of the project which has a depth not in excess of 20 feet;

2. 25 percent of the costs attributable to the portion of the project which has a depth in excess of 20 feet but not in excess of 45 feet; and

3. 50 percent of the costs attributable to the portion of the project which has a depth in excess of 45 feet.

g. As further specified in Article VI hereof, the City shall repay with interest, over a period not to exceed 30 years following completion of the project or separable element thereof, an additional 0 to 10 percent of the total cost of construction of general navigation facilities assigned to commercial navigation, depending on the value, as calculated under Article

IV hereof, of items provided pursuant to paragraph d. of this Article. If the credit allowed for such items is less than 10 percent of the total cost and the percentage of the total cost represented by the value of such items. If the credit allowed is equal to or greater than 10 percent of said total cost, the City shall not be required to repay any additional percentage of the total cost.

ARTICLE III - LANDS, FACILITIES, AND RELOCATION ASSISTANCE

a. Prior to the advertisement of any construction contract, the City shall furnish to the Government all lands, easements, and rights-of-way, including suitable borrow and dredged material disposal areas, as may be determined by the Government to be necessary for construction, operation, and maintenance of the general navigation features, and shall furnish to the Government evidence supporting the City's legal authority to grant rights-of-entry to such lands.

b. The City shall provide or pay to the Government the full cost of providing all retaining dikes, wasteweirs, bulkheads, and embankments, including all monitoring features and stilling basins, determined by the Government to be necessary for construction, operation, or maintenance of the general navigation features.

c. Upon notification from the Government, the City shall accomplish all necessary alterations and relocations of buildings, highways, railroads, storm drains, and other facilities, structures, and improvements.

d. Upon notification from the Government, the City shall perform or assure performance of all necessary alterations and relocations of pipelines, cables, and other utilities. Nothing herein shall be deemed to affect the ability of the City to seek compensation from other non-Federal entities for costs it incurs under this paragraph.

e. The City shall comply with the applicable provisions of the Uniform Relocations Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, approved January 2, 1971, as amended, in acquiring lands, easements, and rights-of-way for construction and subsequent operation and maintenance of the Project, and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

ARTICLE IV - VALUE OF LANDS AND FACILITIES

a. The value of the lands, easements, and rights-of-way to be credited toward the additional 10 percent of total costs the City must repay pursuant to Article II.g. will be determined in accordance with the following procedures:

1. If the lands, easements and rights-of-way are owned by the City as of the date this Agreement is signed, the credit shall be the fair market value of the interest at the time such interest is made available to the Government for construction of the project. The fair market value shall be determined by an appraisal to be obtained by the City which has been

prepared by an independent and qualified appraiser who is acceptable to both the City and the Government. The appraisal shall be reviewed and approved by the Government.

2. If the lands, easements and rights-of-way are to be acquired by the City after the date this Agreement is signed, the credit shall be the fair market value of the interest at the time such interest is made available to the Government for construction of the project. The fair market value shall be determined as specified in subparagraph 1. above. If the City pays an amount in excess of the appraised fair market value, it may be entitled to a credit for this excess amount if the City has secured prior written approval from the Government of its offer to purchase such interest.

3. If the City acquires more lands, easements or rights-of-way than are necessary for project purposes, as determined by the Government, then only the value of such portions of those acquisitions as are necessary for project purposes shall be included in total project costs and credited to the City's share.

4. Credit for lands, easements and rights-of-way in the case of involuntary acquisitions which occur within a one-year period preceding the date this Agreement is signed or which occur after the date this Agreement is signed will be based on court awards, or on stipulated settlements that have received prior Government approval.

5. For lands, easements, or rights-of-way acquired by the City within a five-year period preceding the date this Agreement is signed, or any time after this Agreement is signed, credits provided under this paragraph will also include the actual incidental costs of acquiring the interest, e.g., closing and title costs, appraisal costs, survey costs, attorney's fees, plat maps, and mapping costs, as well as the actual amounts

expended for any relocation assistance provided in accordance with the obligations under this Agreement.

b. The costs of relocations or modifications of facilities (other than utilities) which will be credited towards the additional 10 percent of total costs the City must repay pursuant to Article II.g. will be that portion of the actual costs incurred by the City as set forth below:

1. Highways: Only that portion of the cost as would be necessary to construct substitute highways to the design standard that the State of Alabama would use in constructing a new highway under similar conditions of geography and traffic loads.

2. Facilities (Other than utilities): Actual relocation cost, less depreciation, less salvage value, plus the cost of removal, less the cost of betterments. With respect to betterments, new materials shall not be used in any relocation or alteration if materials of value and usability equal to those in the existing facility are available or can be obtained as salvage from the existing facility or otherwise, unless the provision of new material is more economical. If, despite the availability of used material, new material is used, where the use of such new material represents an additional cost, such cost shall not be credited to the City's share.

c. No credit shall be given for any costs relating to relocations or alterations of utilities.

ARTICLE V - CONSTRUCTION PHASING AND MANAGEMENT

a. To provide for consistent and effective communication between the City and the Government during the term of construction, the City and the Government shall appoint representatives to coordinate on scheduling, plans, specifications, modifications, contract costs, and other matters relating to construction of the Project.

b. The representatives appointed above shall meet as necessary during the term of project construction and shall make such recommendations as they deem warranted to the Contracting Officer.

c. The Contracting Officer shall consider the recommendations of the representatives in all matters relating to the Project, but the Contracting Officer, having ultimate responsibility for construction of the Project, has complete discretion to accept, reject, or modify the recommendations of the representatives.

ARTICLE VI - METHOD OF PAYMENT

a. The City shall provide, over the term of construction, the percentages of the total cost of construction of general navigation facilities assigned to commercial navigation specified in Article II.f. hereof. Such cost is presently estimated to be $5,046,000.00. In order to meet its share, the City must provide a total cash contribution presently estimated to be $504,600.00.

b. The City shall provide its required cash contribution in proportion to the rate of Federal expenditures over the term of the construction period in accordance with the following provisions:

1. For purposes of budget planning, the Government shall notify the City by ____________ of each year of the estimated funds that will be required from the City to meet its share of project costs for the corresponding Government fiscal year.

2. Sixty (60) days prior to the award of the first construction contract, the Government shall notify the City of its share of project costs, including costs attributable to the project incurred prior to the initiation of construction, for the first fiscal year of construction. Within 30 days thereafter, the City shall [select one: provide the requisite amount to the Government in cash by delivering a check payable to "FAO, USAED, Mobile" to the Contracting Officer OR verify to the satisfaction of the Government that it has deposited the requisite amount in an escrow account acceptable to the Government, with interest accruing to the City, OR present to the Government an irrevocable letter of credit acceptable to the Government in an amount sufficient to meet its obligation].

3. For the second and subsequent fiscal years of project construction, the Government shall, 60 days prior to the beginning of the fiscal year, notify the City of its share of project costs for that fiscal year. No later than 30 days prior to the beginning of the fiscal year, the City shall make the necessary funds available to the Government through the funding mechanism specified above.

4. If at any time during the period of construction the Government determines that additional funds will be needed from the City to meet its initial share of project costs, the Government shall so notify the City and the City, within 30 days from receipt of notice, shall make the necessary funds available through the funding mechanism specified above.

c. The Government will draw on the [funds, OR escrow account, OR letter of credit] provided by the City such sums as it deems necessary to cover contractual and in-house fiscal obligations attributable to the project as they are incurred, as well as project costs incurred by the Government prior to the initiation of construction.

d. Upon completion of the general navigation features of project and resolution of all relevant contract claims and appeals, the Government shall compute the total cost of construction of general navigation facilities assigned to commercial navigation and tender to the City a final accounting of its share of project costs. In the event the total contribution by the City is less than its initial required share of project costs at the time of the final accounting, the City shall, within 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to meet its minimum required share of project costs. In the event the City has made cash contributions which result in the City's having provided more than its initial required share of project costs, the Government shall credit the excess to the additional amount the City must repay pursuant to Articles II.g. and II.h. of this Agreement.

e. The City shall repay the additional amount required pursuant to Article II.g. of this Agreement, reduced by any excess cash contribution made during the term of construction, in equal annual installments over a period of not more than 30 years from the date the final accounting is tendered by the Government. Such repayment shall include interest at a rate determined by the Secretary of the Treasury, taking into consideration the average market yields on outstanding marketable obligations of the United States with remaining periods to maturity comparable to the repayment period, during the month preceding the fiscal year in which costs for the construction of the project are first incurred (or, in the case of recalculation, the fiscal year in which the recalculation is made), plus a premium of one-eighth of one percentage point for transaction costs. The interest rate shall be recalculated by the Secretary of the Treasury at five-year intervals. Nothing herein shall preclude the City from repaying this additional amount in full upon receipt of the final accounting. Should this full repayment be made within 90 days from receipt of the final accounting, there shall be no charges for interest or transaction costs.

ARTICLE VII - DISPUTES

Before any party to this Agreement may bring suit in any court concerning an issue relating to this Agreement, such party must first seek in good faith to resolve the issue through negotiation or through other forms of alternative non-binding dispute resolution mutually acceptable to the parties.

ARTICLE VIII - OPERATION, MAINTENANCE, AND REHABILITATION

a. The City shall operate and maintain all portions of the project, except for general navigation features and aids to navigation, in accordance with regulations or directions prescribed by the Government.

b. The Government shall operate and maintain the general navigation features of the project.

c. The City hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon land which it owns or controls for access to the Project for the purpose of completing, operating, repairing, and maintaining the Project. If an inspection shows that the City for any reason is failing to fulfill its obligations under this Agreement without receiving prior written approval from the Government, the Government will send a written notice to the City. If the City persists in such failure for 30 calendar days after receipt of the notice, then the

Government shall have a right to enter, at reasonable times and in a reasonable manner, upon lands the City owns or controls for access to the Project for the purpose of completing, operating, repairing, or maintaining those portions of the Project for which the City is responsible under this Agreement. No completion, operation, repair, or maintenance by the Government shall operate to relieve the City of responsibility to meet its obligations as set forth in this Agreement, or to preclude the Government from pursuing any other remedy at law or equity to assure faithful performance pursuant to this Agreement.

ARTICLE IX - RELEASE OF CLAIMS

The City shall hold and save the Government free from all damages arising from the construction, operation, and maintenance of the Project, except for damages due to the fault or negligence of the Government or its contractors. This shall specifically include, but is not limited to, all damages due to or arising from the complete or partial failure of any bulkhead, retaining wall, pier or other structure located along the Bayou.

ARTICLE X - MAINTENANCE OF RECORDS

a. The Government and the City shall keep books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement to the extent and in such detail as will properly reflect total project costs. The Government and the City shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the Project and resolution of all claims arising therefrom, and shall make available at their offices at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the parties to this Agreement

b. The City shall prepare maps of all lands, easements and rights-of-way obtained by it for construction of the Project. Upon completion of the Project, the City shall provide the Government a copy of said maps.

ARTICLE XI - FEDERAL AND STATE LAWS

In acting under its rights and obligations hereunder, the City agrees to comply with all applicable Federal and State laws and regulations, including Section 601 of Title VI of the Civil Rights Act of 1964 (Public Law 88-352) and Department of Defense Directive 5500.II issued pursuant thereto and published in Part 300 of Title 32, Code of Federal Regulations, as well as Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army."

ARTICLE XII - RELATIONSHIP OF PARTIES

The parties to this Agreement act in an independent capacity in the performance of their respective functions under this Agreement, and neither party is to be considered the officer, agent, or employee of the other.

ARTICLE XIII - OFFICIALS NOT TO BENEFIT

No member or delegate to the Congress, or resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE XIV - COVENANT AGAINST CONTINGENT FEES

The City warrants that no person or selling agency has been employed or retained to solicit or secure this Agreement upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees or bona fide established commercial or selling agencies maintained by the City for the purpose of securing business. For breach or violation of this warranty, the Government shall have the right to annul this Agreement without liability, or, in its discretion, to add to the Agreement or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

ARTICLE XV - TERMINATION OR SUSPENSION

a. If at any time the City fails to make the payments required under this Agreement, the Government shall terminate or suspend work on the Project until the City is no longer in arrears, unless the Government determines that continuation of work on the Project is in the interest of the United States. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13-week

Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

b. If the Government fails to receive annual appropriations in amounts sufficient to meet expenditures for the then-current or upcoming fiscal year, the Government shall so notify the City. After 60 days either party may elect without penalty to terminate the Agreement or to suspend performance thereunder, and the parties shall conclude their activities relating to the project and proceed to a final accounting in accordance with Article VI.

ARTICLE XVI - NOTICES

a. All notices, requests, demands, and other communications required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and delivered personally, given by prepaid telegram, or mailed by first-class (postage-prepaid), registered, or certified mail, as follows:

If to the City:

City of Bayou La Batre

If to the Government:

U. S. Army Corps of Engineers, Mobile District
P. O. Box 2288
Mobile, Alabama 36628-0001

b. A party may change the address to which such communications are to be directed by giving written notice to the other in the manner provided in this section.

c. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at such time as it is personally deliverde or on the third business day after it is mailed, as the case may be.

ARTICLE XVII - CONFIDENTIALITY

To the extent permitted by the law governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

THE DEPARTMENT OF THE ARMY	THE CITY OF BAYOU LA BATRE
BY:________________________ LARRY S. BONINE Colonel, Corps of Engineers District Engineer	BY:________________________ MAYOR
DATE:______________________	DATE:______________________

CERTIFICATION OF AUTHORITY

I, ______________________________, do hereby certify that I am the Attorney of the CITY OF BAYOU LA BATRE; that the City of Bayou La Batre is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the City of Bayou La Batre in connection with the Project and to pay damages, if necessary, in the event of the failure to perform, in accordance with Section 221 of Public Law 91-611, and that the Mayor who has executed this Agreement on behalf of the City of Bayou La Batre, has acted within his statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this ______ day of ________________, 198____.

____
ATTORNEY

City of Bayou La Batre

33 South Wintzell Ave., Bayou La Batre, AL 36509 (205) 433-1906/824-2171

"Seafood Capital of Alabama"

Mayor

J. F. 'Jiggs' Nelson

Council Members

Tom Lamey
Arlen Lyons
Tyler Peek
Leverne Simmons
Robert West

City Clerk

Imelda McClellan

September 7, 1988

Colonel Larry S. Bonine
District Engineer
Mobile District
U. S. Army Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628

Dear Colonel Bonine;

This letter is to express the interest and support of the City of Bayou La Batre in the proposed channel deepening project. The channel improvements described as part of the tentatively selected plan in the draft Feasibility Report would be of significant economic benefit to the City of Bayou La Batre, Mobile County and the State of Alabama.

Recognizing the requirement for non-Federal sponsorship of the project, the City of Bayou La Batre is pursuing the possibility of the State of Alabama serving as the non-Federal sponsor for the project. We are also investigating alternative means of financing a portion of the non-Federal share of project costs at the locate level to supplement any financial assistance from the state. These alternatives included the formation of a private nonprofit corporation, special assessments by the city on improvements to property from the project, and the formation of a port authority. The most promising alternative, however, is the formation of a private, nonprofit corporation to enter into an agreement with the City of Bayou La Batre to supplement potential state funding and to finance certain aspects of the project. Such a corporation was formed in 1987 to finance a $1.2 million wastewater outfall line for the city.

Officials of the City of Bayou La Batre and representatives from the private sector have met with state officials on a number of occasions to discuss non-Federal sponsorship of the project. Although no formal commitment has been made by the state, these meetings have been encouraging. The Governor's staff is presently reviewing documents produced by the Feasibility Study to assess the potential for the state to serve as the non-Federal sponsor or to otherwise participate financially in the project.

The City of Bayou La Batre fully supports the proposed channel improvement project and we will do what we can to provide, within our capability, whatever assistance, be it financial and otherwise, which may be required to achieve a successful completion.

Sincerely,

J. F. Nelson

J. F. Nelson
Mayor

STATE OF ALABAMA
DEPARTMENT OF FINANCE
MONTGOMERY, ALABAMA 36130

GUY HUNT
Governor

G. ROBIN SWIFT, JR.
Director of Finance

April 18, 1989

Colonel Larry S. Bonine
Mobile District
U.S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Bonine:

We have reviewed the final Feasibility Report and the draft Local Cooperation Agreement concerning the proposed channel improvements at Bayou La Batre, Alabama. Recognizing the requirement for and the responsibilities associated with the non-Federal sponsorship, this letter is to express the intent of the State of Alabama to serve as the non-Federal sponsor for the project provided that (1) the State obtains authorization for and does in fact issue a $6,000,000 general obligation bond issue therefor, and (2) that other non-Federal interests as discussed below provide the funds for the non-Federal costs exceeding said $6,000,000.

At this time, it is contemplated that the financing of the non-Federal portion of the project will be provided in the following manner. Provided that the State of Alabama obtains authorization to issue general obligation bonds therefor, it intends to provide sixty percent (60%) of the non-Federal cost up to a maximum of $6,000,000 to construct the project. Legislation authorizing such a bond issue was introduced in the Alabama Legislature on March 28, 1989 and is currently pending consideration. The Mobile County Commission and various interests in Bayou La Batre have verbally committed to split the remaining portion of the non-Federal costs. Mobile County will likely provide its share either through general obligation bonds or from general revenues. Funding from the Bayou La Batre interests is expected through property assessments by the City of Bayou La Batre or related governmental entities or through private business contributions through the formation of a local private non-profit corporation, or a combination thereof.

The State of Alabama fully supports the proposed channel improvements at Bayou La Batre. The channel improvements described as part of the tentatively selected plan in the final Feasibility Report for the project will be of significant economic benefit to the City of Bayou La Batre, Mobile County and the State of Alabama.

Sincerely,

G. R. Swift, Jr.

May 4, 1989

Coastal Section

Mr. G. R. Swift, Jr.
Director of Finance
State of Alabama
Department of Finance
Montgomery, Alabama 36130

Dear Mr. Swift:

This is to acknowledge receipt of your letter of April 18, 1989, in which the intent of the State of Alabama to provide the non-Federal sponsorship for the Bayou La Batre channel deepening project was expressed. Confirmation of our understanding of said intent, which is stated below, is requested. A copy of the revised draft Local Cooperation Agreement (LCA), which will replace the existing draft LCA in the feasibility report, is enclosed for your information.

Revisions to the draft LCA are:

a. The State of Alabama is identified as the non-Federal sponsor for the project.

b. In accordance with the Water Resources Development Act of 1988, the non-Federal costs of utility relocations would be credited against the additional cash payment for 10 percent of the cost of constructing the general navigation features and is described in Article II.g. and Article VI.e.

Although this draft LCA will remain unsigned and, therefore, non-binding at this time, it is materially the agreement which would be formally executed between the State of Alabama and the Federal Government prior to initiation of project construction.

Based upon your letter, our understanding of the intent of the State of Alabama is as follows:

a. The State of Alabama would accept and fulfill all non-Federal sponsorship responsibilities and requirements for the Bayou La Batre project as specified in the draft LCA provided that the State obtains authorization for and does in fact issue a $6,000,000 general obligation bond issue therefor; and that other non-Federal interests provide the funds for the non-Federal costs exceeding said $6,000,000.

b. The State of Alabama would secure all formal second party agreements as necessary to assure the availability of all required non-Federal funding and/or performance of work items, described in Article III of the draft LCA, over that provided by the State of Alabama.

c. The State of Alabama would be willing to sign an LCA and thereby enter into a formal agreement with the Federal Government prior to initiation of project construction, provided that the requirements specified in a. above and similarly described in the State of Alabama letter of intent of April 18, 1989 are satisfied.

I appreciate the interest and willingness expressed by the State of Alabama to serve as the non-Federal sponsor for the Bayou La Batre channel deepening project. We look forward to working with you toward a successful project completion.

Sincerely,

Louis J. Martinez
LTC, Corps of Engineers
Acting District Engineer

STATE OF ALABAMA
DEPARTMENT OF FINANCE
MONTGOMERY, ALABAMA 36130

GUY HUNT
Governor

G. ROBIN SWIFT, JR
Director of Finance

May 24, 1989

Col. Larry S. Bonine
District Engineer
Mobile District
U.S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628

Dear Col. Bonine:

This is in response to the letter we received from the Corps dated May 4, 1989, concerning the non-federal sponsorship of the Bayou La Batre Channel Deepening Project.

Please be advised that it is the intent of the State of Alabama to serve as the non-federal sponsor for the project, provided that: (1) the State obtains authorization for and does in fact issue general obligation bonds with $6,000,000 dedicated to this project; (2) the other non-federal interests identified in my earlier letter dated April 18, 1989, provide the funds for the non-federal costs exceeding the State's 60 percent share; and (3) that the State is able to secure the formal second party agreements necessary to assure the availability of all required non-federal funding and/or performance of work items for the project exceeding that which the State is willing to provide and/or perform.

Provided that the conditions stated above and in my earlier letter to you dated April 18, 1989, are met, it is the intent of the State of Alabama to enter into a Local Cooperation Agreement to be negotiated between the State and the Federal Government, prior to the initiation of project construction, which shall limit the State's financial commitment, inclusive of cash contributions and all work items, to a maximum of $6,000,000.

I hope that this information will be helpful toward the continued progress of the Bayou La Batre project. We look forward to working with Mobile District in this effort.

Sincerely,

GR Swift J

G. R. Swift, Jr.

APPENDIX B

ECONOMIC ANALYSIS

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ECONOMIC APPENDIX
BAYOU LA BATRE, ALABAMA FEASIBILITY STUDY

INTRODUCTION

The purpose of this economic analysis is to establish the levels of national economic development benefit resulting from various modifications to the existing navigation channel at Bayou La Batre, Alabama. The existence of potential increases in the value of goods and services provided by channel users was initially established in a Reconnaissance Report, Survey Investigation for Navigation Improvements at Bayou La Batre, U.S. Army Corps of Engineers, Mobile District, February, 1985. The categories and magnitude of these economic outputs have been more thoroughly defined and described in the following paragraphs.

The scope of this economic analysis includes an in-depth and detailed evaluation of the commercial fishing vessel operations, the ship repair and new vessel construction industry, and anticipated changes in seafood catch and processing and associated types of vessels using the Bayou La Batre channel. Data were collected through field interviews; formal meetings with local fishing/shipbuilding interests; and from published sources documenting vessel landings, operational characteristics and costs for vessels in Bayou La Batre, and demand and supply of various seafood species. This analysis includes a brief history of the study area; a description of the economic base; a definition of the problems and opportunities for channel users; and an evaluation of future benefits which may accrue with increased channel depths and other associated navigational improvements.

GENERAL

History of the Study Area. This small predominantly Catholic town is replete with generations of seafaring/fishing families who guardedly pass occupational knowledge and folklore down to their next generation. Located off Mississippi Sound in the extreme southwestern corner of Mobile County, Bayou La Batre is well isolated from other population centers in coastal Alabama. Indeed, historical records indicated such isolation was one of the prime reasons for initial settlement around the bayou. In 1786, Joseph Baussage petitioned the Spanish Governor of the Louisiana Holding for "a piece of land situated on Bayou Batre ...in order that he (and his wife and children) may live thereon undisturbed, and conceal from the eyes of the world his poverty and misery...". 1/ (The name Baussage has various modern spellings, including Bosarge and Bosage.) The petition was granted and Monsieur Baussage and his family established residency to fish and plant corn. Baussage, additional colonists and their contemporary descendants were not interested in pirating and smuggling as was Jean Baptiste or Sieur de Bienville, former governor of French Louisiana. When the latter retired from the governorship of Louisiana, he settled in Bayou La Batre in 1713. He built the battery of artillery for which the bayou is named, became a much-feared pirate and prospered from his clandestine ventures. Once coastal Alabama was opened to British and American settlers; fishing, livestock and later resort hotels became the important economic pursuits. At the turn of the 20th century, however, fishing and seafood processing were predominant, with shipbuilding gaining importance from the time of World War I. 2/ (Shipbuilding has continued to grow, since the shipbuilder in Bayou La Batre (BLB) usually continues to own a fishing fleet in order to keep abreast of fishing technology firsthand.)

The commercial fishing fleet in Bayou La Batre is one of the most colorful, celebrated fleets in the U.S. Religion and customs of the area bring tourism from all over the U.S. each Spring to celebrate the beginning of each fishing season in an event called, "The Blessing of the Fleet." Over 400 decorated vessels parade the bayou each Spring awaiting their turn for the Archbishop of the Mobile/Birmingham Diocese to convey three (3) blessings upon the men and their vessel: safety at sea, good health, and a bountiful harvest of seafood.

Economic Base. From the time of incorporation in 1955, the city has had a relatively stable population. From a 1960 count of 2,572 persons, through 1970 with 2,664 to the 1980 decennial of 2,005 individuals, the degree of fluctuation has been minor, except for the late 1970's and early 1980's during which population out-migration occurred because of a slump in the oil exploration industry. Data sources for 1984 3/ indicated an increase in population to 2,162. With a land area of 3.0 square miles, or 22,368 acres, population density varies slightly also, averaging approximately one acre per inhabitant of Bayou La Batre. Distribution is a more accurate measure than density for showing settlement patterns. Not surprisingly, people have clustered along the bayou proper, which reflects its importance in their lives.

Table 1 portrays demographics of the population of Bayou La Batre in relation to Mobile County and the State of Alabama. There are no drastic differences between the three entities, except the fluctuations in the number of persons from 1970-1984 at Bayou La Batre. Table 2 gives characteristics about the housing available in the town. Owner-occupancy housing is more prevalent in the town than in the county or state, but the median value of this housing in the town is, not surprisingly, less than that of the county or state. Table 3 shows employment and income characteristics for the town, again, in comparison to the county and state. Of the town's population, 35 percent are employed, which is lower than that percentage for the county or state (31 percent are less than 18 years of age and 14 percent are 65 and older equalling 45 percent in these two categories). Therefore, 20 percent are either unemployed, work outside the city or are self-employed which may not have been ascertained by the source solicitors. Based upon MDO field data combined with the 1987-1988 Alabama Directory of Mining and Manufacturing, the employment in Bayou La Batre would seem to be higher than that shown in the latter sources in Tables 1-3. For example, the ten (10) largest wholesale seafood processors seasonally employ from 900 to 1200 (this excludes employment in another 26 small retail seafood houses); and the sixteen (16) shipbuilders employ 700 to 1,000 employees annually. These figures exclude employment in the marine related industries along the bayou (outrigging, net making, trawl board manufacturing, diesel fuel sales, etc.), self-employed crews of 504 vessels in the home-based commercial fishing fleet, and the self- employed crews/owners of the crab and oyster boats. Admittedly, the potential for double counting employment is high since a shipyard worker may crew a shrimp trawler during the two major shrimping seasons, and may oyster and crab during these seasons additionally. A private consultant for the city (Galbraith & Associates) indicates that there are 4500 employed in seafood/shipbuilding industries in Bayou La Batre annually. An apparel manufacturer located at Bayou La Batre employees 500 employees annually 13/, which brings the total jobs available to 5,000 annually.

TABLE 1
Population for Selected Years and Population Characteristics of Bayou La Batre, Mobile County and the State of Alabama in 1980

Item	Bayou 4/ La Batre	Mobile 5/ County	State 4/ of Alabama
Population			
1984	2,162	378,800 6/	3,990,221
1980	2,005	364,980	3,893,888
1970	2,664	317,308	3,444,165
Percent Change 1970 to 1980	-24.7	15.0	13.1
Percent Black	9.6	31.56	25.6
Percent Spanish Origin	1.6	1.0	0.9
Percent Male	46.5	48.0	48.1
Median Age	29.1	27.8	29.2
Total Number of Families	517	94,386	1,038,881
% Married Couples 5/	78.9	77.9	81.4
% Female Householder, no husband present 5/	16.6	18.6	15.5

TABLE 2
Housing Characteristics of Bayou La Batre, Mobile County and the State of Alabama, 1980 7/

Item	Bayou La Batre	Mobile County	State of AL
Total No. Households	712	123,298	1,341,856
Percent Change 1970 to 1980	-9.6	34.4	29.8
No. persons per household	2.82	2.91	2.84
Total No. of Housing Units 8/	741	131,301 9/	1,450,011
No. Occupied Units	712	123,298 9/	1,341,856
No. Owner Occupied Units	502	81,377 9/	941,219
Value Owner Occupied 8/			
No. less than $20,000	139	NA	161,588
No. Over $50,000	46	NA	181,701
Median Value	$25,000	$37,500 9/	$33,900

NA = Not Available.

TABLE 3
Employment and Income Characteristics of Bayou La Batre, Mobile County and the State of Alabama 10/

Item	Bayou La Batre	Mobile 11/ County	State of Alabama
1980 Population	2,005	364,980 12/	3,893,888
Employment 1980			
Total No employed	702	142,825 12/	1,511,928
% of Population	35.0	39.1 12/	38.8
% in Manufacturing	15.0	20.0 12/	26.1
% in Wholesale/ Retail trades	30.0	22.0 12/	19.2
Income			
Per Capita in 1983	$ 5,527	$ 9,149 11/	$ 7,603
Median Family in 1979	$13,468	$ 17,354 12/	$ 16,347

PROBLEMS AND OPPORTUNITIES

The problems and opportunities in the study area are all related to the marine activities using the existing Bayou La Batre channel. Both the problems an opportunities are associated with operational and production inefficiencies for the commercial fishing fleet, shipbuilding industry, and other marine related industries. A more detailed discussion of the problems and opportunities within the Bayou La Batre study area are contained in the Main Report.

ANALYTICAL CONSTRAINTS

During field interviews, there [illegible] incongruent opinions among the channel users concerning problems associated with use of the existing channel; e.g. it was necessary to carefully screen damages which occurred during vessel launch to determine if they were attributable to an inadequate launch area (shipbuilder responsibility) or to the channel depth. It was also an arduous process to ascertain operational patterns of the commercial fishing fleet, since the entire fleet is never assembled at any one time within the Bayou. Between fleet captains and seafood processors, reliable operational data were obtained about the entire fleet which would identify its operational patterns and operational costs. Minimum operational needs (underkeel clearances, probabilities of delays, etc.) had to be clearly understood by all interested parties and correlated with overall operations so that consistent reliable data were obtained. It was not uncommon to interview a channel user twice in order to make sure the data matched the operations of the fishing vessel or shipbuilder. Accordingly, the data herein accurately represents the operations of all industries on the Bayou and forms a valid base from which to analyze benefits.

Data on vessel damage and delays by vessel name are kept by two commercial operations within the Bayou. Other commercial firms only maintained these data as an aggregate cost for the fleets on an annual basis. No firms kept complete records of the exact time of damages, which would have allowed correlation to available tides and depths.

EVALUATION METHODOLOGY

General. All users along the channel were interviewed by MDO personnel. The users' costs and revenues were discussed, described, analyzed and categorized by industry. Descriptions of each industry are presented in the following paragraphs. An analysis of operational characteristics, costs, and revenues is also provided by industry and/or individual user (shipbuilder) where necessary. The economic costs are categorized by industry for the Existing Condition, Without-Project Conditions and With-Project Conditions. Benefits attributed to various channel deepening plans are those costs which are reduced or eliminated when compared to Without-Project Conditions. A sensitivity analysis was performed to address the effects of alternate future condition scenarios of channel use under the Without-Project Condition.

Change in Income. The basis for evaluating improvements to the existing federal channel at Bayou La Batre is the change in net income to users of the channel. For the commercial fishing fleet, this is the cost savings to harvest projected seafood landings. These savings are measured as the reduced cost associated with shorter and fewer delays, reduced damages, and increased opportunities to labor. For shipbuilders, cost savings are measured as reduced production inefficiencies attributable to increased depth availability (both in magnitude and duration).

THE BAYOU LA BATRE SEAFOOD INDUSTRY--EXISTING CONDITIONS

General. Bayou La Batre has a history of continued growth in the seafood industry. Over time, seafood harvesting and processing have been the primary source of employment and income to the area. Due to the overall efficiency of the seafood operations at the port, Bayou La Batre products are marketed throughout the world. According to the Alabama Sea Grant Advisory Service, a total of 57 seafood processors operate in Bayou La Batre or along the channel. Ten (10) major wholesale seafood processing plants in Bayou La Batre employed from 900 to 1,200 full-time and/or seasonal employees in 1986 14/. Seafood processing is the largest dollar volume and largest employment industry in the study area. In most cases, the owner of the seafood processing business is also the owner of a fleet of commercial fishing vessels -- the ancillary business which would offer diversity and increased annual incomes for the seafood processors. Also in most cases these seafood businesses are the second or third generation owners who are passing the technology to their children.

Magnitude of the Seafood Industry at Bayou La Batre. As shown in Table 4, Bayou La Batre was 29th in the United States' ports in 1986 in landings and 7th in the nation in value of catch. It should be noted that, of the top ten (10) ports in Table 4 which shows the largest quantity of fish landed, the top seven (7) are predominately "pet food" ports which is reflected by their relatively lower total landed value. Of the Gulf of Mexico ports, only two ports (Brownsville-Port Isabel, TX and Arkansas Pass-Rockport, TX) exceeded Bayou La Batre's total value of shrimp landings. Bayou La Batre is the largest volume seafood port in Alabama. Approximately 85% of the total quantity for the state of Alabama and 90% of Mobile County's total value of landings occur at Bayou La Batre.

TABLE 4
U.S. COMMERCIAL LANDINGS 15/

COMMERCIAL FISHERY LANDINGS AND VALUE AT MAJOR U.S. PORTS, 1984-86

Port	Quantity 1984	Quantity 1985	Quantity 1986
	- -Million Pounds- -		
Cameron, LA	679.2	673.6	616.8
Pascagoula-Moss Point, MS	425.3	423.2	365.5
Empire-Venice, LA	383.5	224.5	317.6
Intercoastal City, LA	(1)	(1)	298.9
Dulac-Chauvin, LA	327.2	398.6	294.6
Los Angeles, CA	237.0	150.3	187.4
Kodiak, AK	113.6	96.1	124.0
Gloucester, MA	179.1	116.5	110.0
Beaufort-Morehead City, NC	185.3	133.2	98.9
Dutch Harbor-Unalaska, AK	46.9	106.3	88.3
Petersburg, AK	54.1	(1)	85.2
New Bedford, MA	99.5	90.6	65.8
Point Judith, RI	69.9	56.8	52.1
Biloxi, MS	50.8	41.1	46.7
Bellingham, WA	34.0	38.8	45.9
Rockland, ME	42.9	58.6	43.2
Ketchikan, AK	(1)	(1)	42.2
Seattle, WA	60.3	42.2	38.2
Astoria, OR	23.1	25.5	36.8
Cape May-Wildwood, NJ	34.1	30.3	36.6
Portland, ME	37.0	36.1	34.9
Boston, MA	20.2	19.8	31.4
Port Hueneme, Oxnard, and Ventura, CA	9.4	19.9	31.0
Ocean City, MD	24.4	24.5	29.1
Wanchese-Stumpy Point, NC	28.1	22.7	27.2
Aransas Pass-Rockport, TX	25.2	24.2	27.1
Newport, OR	25.7	29.4	26.7
San Francisco Area, CA	22.4	31.0	25.9
Bayou La Batre, AL	18.2	21.0	25.6
Brownsville-Port Isabel, TX	23.0	22.9	25.5
Sitka, AK	39.8	(1)	25.2
Golden Meadow-Leeville, LA	16.2	18.7	25.1
Hampton Roads Area, VA	33.3	24.4	24.8
Coos Bay-Charleston, OR	20.1	25.6	24.3
Westport, WA	15.0	12.8	22.9
Atlantic City, NJ	28.8	21.9	22.0
Cresent City, CA	15.9	19.8	20.9
Eureka, CA	22.5	28.5	19.4
Delcambre, LA	8.6	7.7	18.7
Ilwaco-Chinook, WA	10.6	7.0	18.3
Fort Bragg, CA	12.7	16.0	17.8
Morgan City-Berwick, LA	(1)	7.7	17.4
Lafitte-Barataria, LA	12.5	20.6	16.8
Monterey, CA	30.3	18.2	16.4
Delacroix-Yscloskey, LA	10.8	11.0	16.3
Key West, FL	17.7	15.3	15.4
Blaine, WA	12.5	18.7	14.3
Grand Isle, LA	9.2	11.1	14.0
Chincoteague, VA	9.3	12.2	13.9
Santa Barbara, CA	10.1	10.7	13.7

Port	Value 1984	Value 1985	Value 1986
	- -Million Dollars- -		
New Bedford, MA	107.7	103.2	106.0
Dulac-Chauvin, LA	59.7	59.9	71.0
Kodiak, AK	69.9	65.8	70.2
Brownsville-Port Isabel, TX	51.0	49.6	69.3
Aransas Pass-Rockport, TX	51.1	43.0	60.3
Empire-Venice, LA	41.6	34.3	47.1
Bayou La Batre, AL	31.5	30.4	43.3
Golden Meadow-Leeville, LA	23.6	23.5	40.0
Petersburg, AK	24.9	(1)	38.1
Gloucester, MA	37.1	37.1	37.8
Dutch Harbor-Unalaska, AK	20.3	21.3	37.1
Cameron, LA	38.2	29.9	34.8
Port Arthur, TX	(1)	29.9	34.8
Los Angeles, CA	84.6	32.5	29.5
Bellingham, WA	14.9	16.6	28.8
Point Judith, RI	27.3	28.0	28.5
Delcambre, LA	14.9	12.7	28.4
Key West, FL	21.8	23.3	27.4
Freeport, TX	19.1	17.2	26.7
Beaufort-Morgan City, NC	21.6	22.7	24.7
Lafitte-Barataria, LA	24.1	29.0	24.1
Hampton Roads Area, VA	29.5	22.5	23.6
Portland, ME	14.5	17.2	22.4
Seattle, WA	16.5	18.7	21.8
Sitka, AK	26.8	(1)	21.8
Galveston, TX	20.1	13.4	20.9
Cape May-Wildwood, NJ	21.4	18.1	20.9
Ketchikan, AK	(1)	(1)	20.8
Pascagoula-Moss Point, MS	25.0	18.4	20.4
Boston, MA	11.2	12.1	19.1
Astoria, OR	9.2	9.5	16.4
Cape Canaveral, FL	26.2	21.2	15.9
Biloxi, MS	20.7	13.4	15.2
Newport, OR	9.5	12.8	13.5
Bon Secour-Gulf Shores, AL	11.5	10.2	13.5
Montauk, NY	9.7	8.9	12.8
Newport, RI	(1)	13.7	12.8
Atlantic City, NJ	14.4	11.9	12.7
Delacroix-Yscloskey, LA	10.8	10.6	12.5
Apalachicola, FL	13.2	12.4	12.4
Ocean City, MD	11.0	11.1	12.3
Wanchese-Stumpy Point, NC	10.8	13.3	12.3
Grand Isle, LA	11.0	12.4	11.9
Coos Bay-Charleston, OR	6.4	10.4	11.9
Fort Myers, FL	13.9	15.4	11.5
Westport, WA	6.6	9.8	11.3
Intercoastal City, LA	(1)	(1)	11.3
Blaine, WA	6.9	12.3	11.1
San Francisco Area, CA	9.2	12.5	11.1
Cresent City, CA	7.0	8.1	10.6

(1) Not available. Record quantity was 848.2 million lb landed in Los Angeles, California in 1950, and value $132.9 million in 1981 at Kodiak, Alaska.

NOTE:--Data for some ports are estimated. To avoid disclosure of private enterprise, Reedville, Va. is not included.

Based upon data from 1980-1986 in Table 5, the most valuable product landed at the Bayou was shrimp. During 1986, 14,500,000 pounds of shrimp were landed at the Bayou with an ex-vessel value of $36,700,000 ($2.53 average price per pound). In addition to the volume of shrimp being offloaded into the port by vessel, large amounts of seafood reach the port by truck. In 1986, over 28 million pounds of shrimp were transported by truck to Bayou La Batre for processing and wholesale distribution based upon information received from the National Marine Fisheries Service (NMFS) representative at Bayou La Batre. According to local interests, some of the shrimp are from foreign countries and are imported mainly through Miami, FL and New Orleans, LA. Some of the processors purchase domestic shrimp at other Gulf of Mexico and South Atlantic ports; also a small number of the Gulf boats based at Bayou La Batre offloaded their catch at other ports during the shrimping season and trucked their catch back to Bayou La Batre. From all these sources, 28 million pounds of additional shrimp were truck to Bayou La Batre by mainly wholesale processors who have control over the product during the entire catch, manufacture, and market sequence up to the time the product reaches the retail level of sale. In summary, approximately 42,500,000 pounds of shrimp was processed at Bayou La Batre during 1986. Applying the ex-vessel price per pound reported for Bayou La Batre to this quantity of shrimp yields a total value of $107,500,000.

TABLE 5
Shrimp vs Total Fisheries Landed At Bayou La Batre
1980-1986

Shrimp (Heads On) 16/	1980	1981	1982	1983	1984	1985	1986
Catch (Millions of lbs)	10.0	12.1	7.8	3.6	6.2	8.1	11.6
Value (Millions of $)	2.7	6.4	6.8	2.5	3.5	6.4	6.6
Avg $ per pound	0.27	0.53	0.87	0.69	0.56	0.79	0.57
Total Fisheries 17/							
Catch (Millions of lbs)	19.9	25.1	17.8	13.6	18.2	21.1	25.6
Value (Millions of $)	23.7	31.4	33.8	28.5	31.5	30.4	43.3
Avg $ per pound	1.19	1.25	1.90	2.10	1.73	1.44	1.69

According to the NMFS representative at Bayou La Batre, total earnings by specific product for all major processing houses at the Bayou in 1986 were as follows:

TABLE 5A

Seafood Earnings - Bayou La Batre - 1986

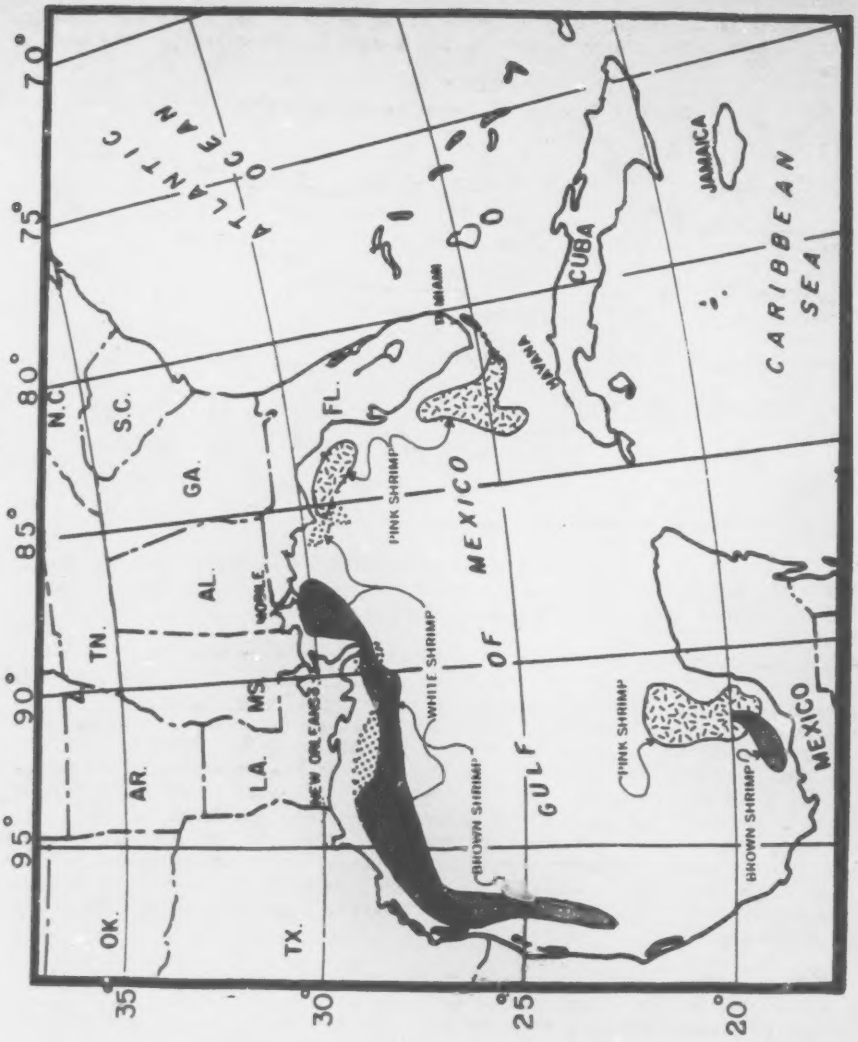
Product	Pounds	Value
Processed shrimp (heads off)	26,565,000 a/	$108,415,000
Oysters (8.75 lbs per gal.)	1,575,000	4,700,000
Picked Crab Meat	1,205,000	7,285,000
Misc.(Fish, Crabs, etc.)	737,000	2,318,000
Totals	30,082,000 b/	$122,718,000

a/ The conversion to heads on is 26,565,000 x 1.6 = 42,504,000 pounds.

b/ This figure will not match the data in Table 5 for 1986; these figures are the weight and value of seafood processed from supplies which have been trucked into and landed at the Bayou.

Habitat and Migration of Shrimp. The shrimp resource in the Gulf of Mexico consists of three species: brown shrimp (Penaeus aztecus Ives), white shrimp (Penaeus setiferus Linnaeus), and the pink shrimp (Penaeus duorarum Burkenroad). Areas of the Gulf where the adult shrimp of each species can be found depends primarily upon the type of bottom sediment. See Figure 1. The area from the Texas-Mexico border to just west of the Texas-Louisiana border consists of mainly sand and finer grain sediments and is inhabited by brown and white shrimp. The second area which extends east to Pascagoula Bay, Mississippi is mainly a complex of fine grain sediments, or mud, caused from deposition by the Mississippi River and is inhabited by brown and white shrimp. The third area begins with sand and shell in Alabama, and gradually becomes laden with coral at the southern Florida coast and is inhabited by pink shrimp.18/

Brown shrimp spawn in the Gulf of Mexico from November to April, at which time the larvae migrate to an estuary, such as Mobile Bay and Mississippi Sound. As they grow and mature into adults, they migrate back offshore from May to August. Peak months for largest catch are June and July. White shrimp spawn in the Gulf of Mexico from March to October. The larvae then migrate to the estuary between the months of May and October. The white adult shrimp subsequently migrate offshore between June and November. Peak months for largest catch are September and October. (Pink shrimp are not a readily available resource for the Bayou La Batre shrimper since the major pink shrimp grounds are off the tip of Florida and the Yucatan in the Gulf of Mexico.)


70°
75°
80°
85°
90°
95°
35
30°
25°
20°
ATLANTIC OCEAN
N.C.
S.C.
GA.
FL.
TN.
AL.
MS.
LA.
AR.
OK.
TX.
MOBILE
NEW ORLEANS
MIAMI
HAVANA
CUBA
JAMAICA
CARIBBEAN SEA
GULF OF MEXICO
PINK SHRIMP
WHITE SHRIMP
BROWN SHRIMP
PINK SHRIMP
BROWN SHRIMP
MEXICO

Source: National Marine Fisheries Service., 1972

FIGURE 1
SHRIMP GROUNDS IN GULF OF MEXICO

Generally, Mobile Bay is open to shrimping all year except from mid-April to mid-May of each year. The Gulf of Mexico is open to shrimping year-round. The brown shrimp season normally is during the summer months and the white shrimp season is in the fall of the year. The peak months are generally May through December for shrimping and all year long for fishing.

Annual Yield of Shrimp. Based upon historical catches of shrimp in the Gulf of Mexico over the last 26 years (Figure 2)19/, the annual catch trend has been increasing 1.99 percent annually. (Using the period 1976-1986 the growth trend drops to 1.91% per year.) Based upon the maximum probable catch (MPC) projections by the Gulf of Mexico (GOM) Fisheries Management Council, 345.6 million pounds of shrimp (heads on) are available for harvest annually in the GOM (the annual biomass is unknown).20/ This figure includes recreational (7.4%), bait (1.8%) and discard (3.7%) shrimp, or, 12.9 percent of the total available shrimp; therefore, the MPC available to the commercial fleet for harvest is 301.7 million pounds annually. As shown in Figure 2, 304.0 million pounds of shrimp were harvested by the commercial fleet from the Gulf of Mexico in 1986.

Other Fisheries. Generally, vessels engaged in harvesting oyster, crab, and other types of commercially sold fish do not require channel depths greater than 10 feet. Slightly less than 12 percent of the value of all landings at Bayou La Batre are for catch other than shrimp. Accordingly, the vessels engaged in the aforementioned fisheries are not a part of this analysis. Two exceptions to this statement are the butterfish and surimi industry which are discussed later.

Fleet Shrimping Patterns.

Figure 3 displays shrimp catches by area by month for 1986 for the entire Bayou La Batre fleet. These data were supplied by the NMFS office at Galveston, Texas based upon a grid system which differentiates inland waters from the open Gulf. The data are separated into those catches east, due south and west of the Bayou La Batre channel and are based upon the reporting of the total 1986 landings for the Bayou.21/ These data indicate that 66 percent of the catch was from open Gulf waters and 34 percent was from inland/bay waters.

It should be noted that there is a smaller catch during January through April for the fleet in Figure 3. The effort to catch ratio is dramatically increased during these months due to fewer shrimp being available and the shrimp are caught in deeper waters.

Reaggregation of these same data shown in Figure 3 indicates that 29 percent were caught in waters due south of Bayou La Batre which included the area in the Gulf from Mobile Bay to the west end of Chandelier Island off Louisiana. These data also showed that the remainder of the catches were proportioned to the western Florida Coast (5 percent) and to Mississippi and Louisiana waters (64 percent). (Landings from Texas waters amounted to 1.5 percent, and were caught just inside the Texas border).

Based upon Figure 2 which shows the most fertile shrimp grounds and Figure 3 which shows the catch by area by month, the movement of the Bayou La Batre fleet is quite evident. From January through May, the bay boats are

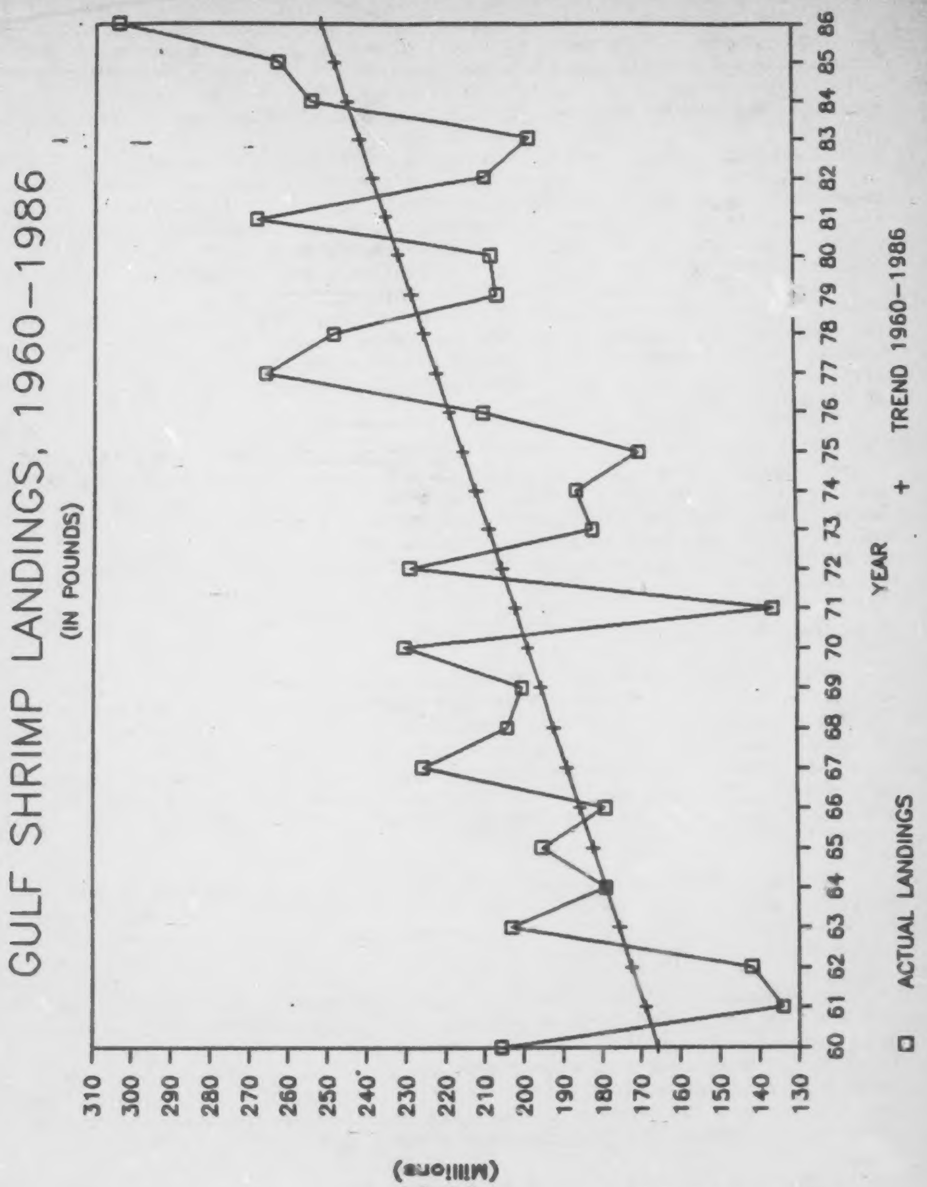

GULF SHRIMP LANDINGS, 1960–1986
(IN POUNDS)
POUNDS
(Millions)
310
300
290
280
270
260
250
240
230
220
210
200
190
180
170
160
150
140
130
60
61
62
63
64
65
66
67
68
69
70
71
72
73
74
75
76
77
78
79
80
81
82
83
84
85
86
YEAR
□ ACTUAL LANDINGS
+ TREND 1960–1986

FIGURE 2

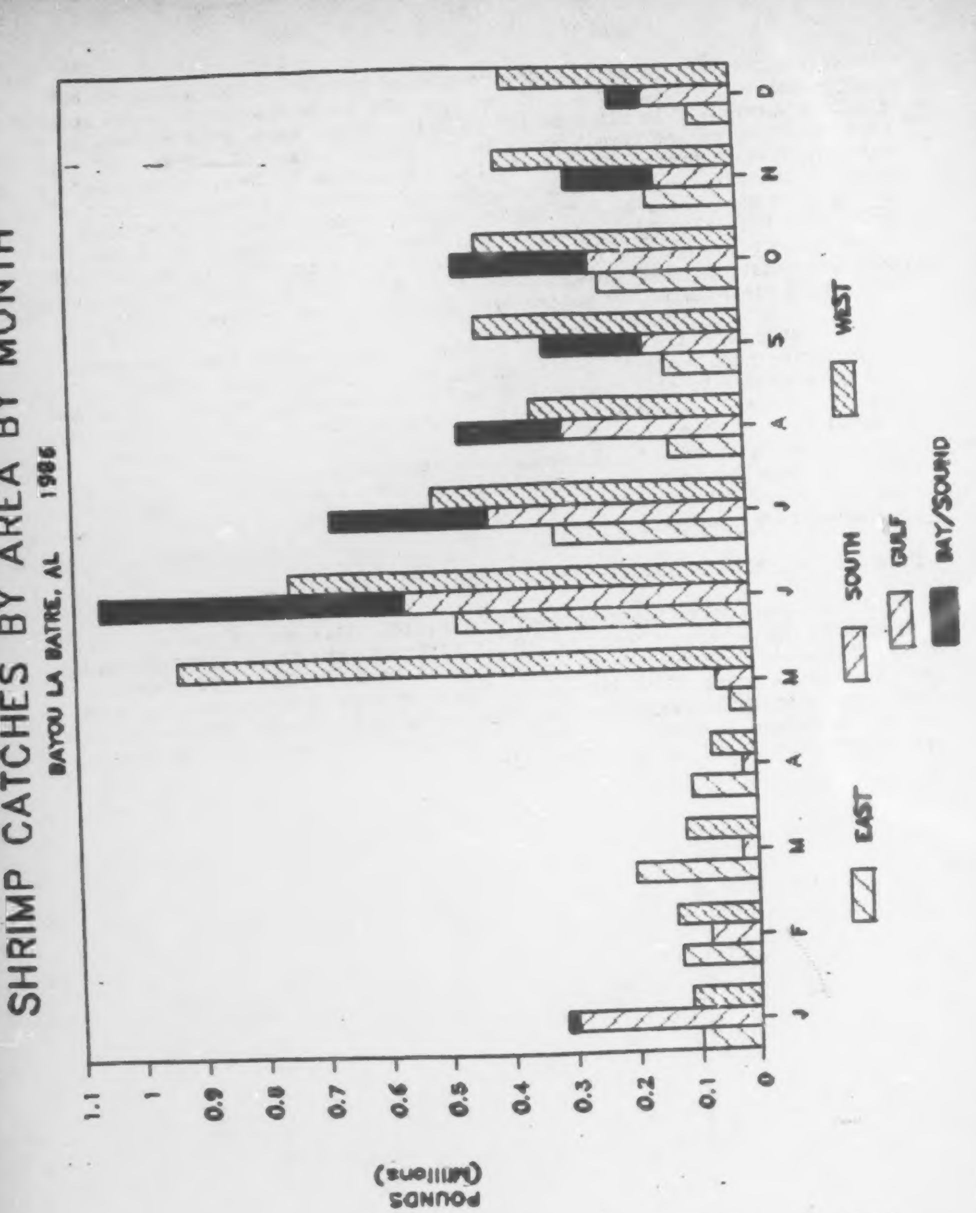

SHRIMP CATCHES BY AREA BY MONTH
BAYOU LA BATRE, AL 1986
POUNDS (Millions)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
J
F
M
A
M
J
J
A
S
O
N
D
EAST
SOUTH
GULF
BAY/SOUND
WEST

FIGURE 3

virtually idle, and the gulf boats are divided between offshore Florida but mainly offshore Louisiana until 15 May when the Louisiana brown season opens in inland waters. This attracts the majority of the Bayou gulf boats. By June, the brown shrimp season opens in the inland waters of Alabama and Mississippi which brings some of the gulf boats back to local waters, and it activates the bay fleet. During July through September, the distinction of a bay and gulf boat fades as both shrimp in both types of waters (bay/sound versus open waters). By October the white shrimp season opens along the entire Gulf Coast, and the gulf boats shrimp more along the Mississippi and Louisiana coasts October through December. While the white shrimp season is waning to a close in inland waters by mid-January, the bay boats are idled.

The Bayou La Batre gulf vessel rarely shrimps further than 8 hours in distance from home so that the vessel can return to the Bayou seafood processing houses to sell their catch and for crew rest. Prices paid in the Bayou are almost always higher than Louisiana prices. Higher prices are paid by Bayou seafood processors for two reasons: a) the owner must pay for trucking the catch back to the Bayou if landed in Louisiana which is a reduction in price to crew/captain; and, b) prices decrease in Louisiana when the inland waters of Louisiana open and the supply of shrimp is increased dramatically.

Vessel Trips and Operating Costs.

Based upon field data developed by District staff and by research consultants 22/ under contract to Mobile District, the larger shrimp vessels (loaded drafts 11-16 feet) make an average of 18 shrimping trips annually which are an average of 14 days each. Their average catch, gross revenues and average operating expenses are shown in Table 6. These figures are based on the operating expenses of a 12-foot loaded draft vessel, or, the most prevalent size vessel in the fleet.23/

TABLE 6
Average Annual Revenue and Costs Associated with Operating a Larger Shrimping Vessel Out of Bayou La Batre
July, 1987 Prices

Revenues	
135,000 pounds of Shrimp @ $2.53 per pound (18 trips)	$341,550
Variable Costs	
Effort Expense a/	82,489
Catch Expense	
Crew Share (crew of 3; 26.6% of catch)	86,184
Captain's Share (12%)	38,880
Other Catch Expense b/	2,493
Total Variable Costs	$210,046
Fixed Costs c/	41,965
Return to Management (10% of Variable Costs)	21,005
Total Costs	$273,016

a/ Includes fuel, ice, engine repair and maintenance, general boat repair, gear repair and purchase, and marine hardware and supplies.

b/ Includes groceries and other catch expense.

c/ Includes normal hull repair, interest, insurance, depreciation and other fixed costs.

Characteristics/Operational Patterns of the Bayou La Batre Commercial Fishing Fleet. The following paragraphs describe the Bayou La Batre fleet's physical and operational characteristics.

Sizes of Vessels:

Seafood processors and dealers at Bayou La Batre are supplied by vessels based at the port and by a number of transient shrimping vessels. According to data obtained in the 1986-1987 field survey, the resident vessels number 504 while the transient vessels number 100 or 604 vessels in total. Based on a tabulation of data submitted by local interests, the Bayou La Batre resident/permanent fleet was distributed as shown in Table 7.

TABLE 7
Distribution of Bayou La Batre Resident Shrimp Fleet
by Loaded Draft a/
July, 1986

Loaded Draft	No. of Vessels
2'-3'	186
4'-7'	50
8'-10'	135
11'-14'	132
15'-16'	1
Total	504

a/ Vessel lengths range from 25 to 100 feet; beams range from 10-28 feet.

The total fleet (resident and transient) can be divided into two classes which are determined by operational patterns and not necessarily by loaded draft: gulf boats and bay boats. Gulf boats make average 14-day trips, and bay boats make 4-day trips. Based on interview data the Bayou La Batre fleet is a 50/50 split between bay and gulf boats, and the transient fleet is all gulf boats. Therefore, the total Bayou La Batre gulf fleet was determined as 352 boats. The total bay fleet was determined to be 252 boats.

Vessels Requiring a Deeper Channel.

Vessels with fully loaded drafts of 10 feet or less can operate on the waterway with few difficulties and have been excluded from further analysis. Vessels having loaded drafts exceeding 10 feet can be expected to experience delays or damages due to insufficient channel depth during some time of the year. Based on field data supplied by seafood operators, there are approximately 142 vessels in this category which is comprised of 133 homebased vessels and 9 transient vessels. All of these vessels are gulf boats. The distribution of these shrimp vessels by loaded draft is shown in Table 8.

TABLE 8

Distribution of Total Shrimp Fleet Serving Bayou La Batre By Loaded Drafts Exceeding 10 Feet (July, 1986)

Loaded Draft	No of Vessels
11'	24
12'	101
13'	4
14'	12 a/
16'	1 b/
Total	142

a/ 9 of these vessels are from the transient fleet which operate more out of Bayou La Batre than out of their home port.

b/ This vessel cannot fully load at the Bayou; high tides are not available to support this draft.

Vessels Designs.

Almost all of the vessels operating out of the Bayou are constructed with steel hulls and have the following items which are located at or near the bottom of the vessel:

a. Transducer - located 6 inches from the outside bottom of the port side, is a device used for determining water depth and fish finding;

b. "Lister" Coolers - located 8 inches from the outside bottom on the starboard side, is a brand name for two small engines for battery charging and for auxiliary pumps (heat exchange) which are vented to the deck;

c. Engine (keel) Cooler - located 8 inches from the outside bottom on the starboard side, is a system of elongated pipes which circulate fresh water against the hull of the vessel for cooling the main drive of the engine;

d. Freon (keel) Cooler - located 8 inches from the outside bottom on the port side, is a system of elongated pipes which circulate fresh water against the hull of the vessel to cool the drive of the separate engine(s) for refrigeration system;

e. Sea Chest - located 0.5 to 1.0 inches from the inside bottom, is the sea water intake and pump system for water cooling systems of the main engine and refrigeration engine, a pump which provides for deck wash down, salt-water intake for condensing unit of refrigeration system, pump for crew bathing, etc. The opening to the sea chest is a small screened hole in the hull which must be kept clear from the channel bottom to avoid intake of sediment and other potentially clogging matter;

f. Roll Chock - located outside on both sides of the vessel from mid-bow to mid-ship, is a fin-like steel attachment which resists water when the vessel is exposed to side seas and lessens the roll of the vessel; the bottom of the roll chock protrudes 14 to 16 inches at 45 angels to the keel;

g. "Sat-Nav" System - located on the keel and protruding 3 inches below the keel, is a satellite navigation system which requires a speed log under the hull;

h. Kort Nozzle - a steel band around the propeller which is flush with the bottom of the hull, provides the engine with more thrust for pulling nets and more speed, but less maneuverability;

i. Propellar - located at the stern and flush with the vessel keel, is a system of blades which propel the vessel;

j. Shaft - located inside the center of the vessel, is a rotating rod which connects to the engine and the center of the propeller; and

k. Rudder - located at the stern of the vessel and below the propeller and flush with the bottom of the keel, is a vertical blade which changes the vessel's direction.

The keel coolers (engine and freon) can be of two types -- those fabricated by the shipyard, as an integral port of the hull but extending below the hull, or simply a system of steel pipes separate from but attached to the hull and located outside the vessel. The latter are more susceptible to damage. The bigger the vessel, the more systems (keel coolers) that are needed to provide water, air and heat exchange to properly operate the engines/systems of the vessel.

Susceptibility to damage for the items mentioned above depend on their proximity to the keel and their sensitivity to intake of the fluff and mud from the channel. This is of particular concern in the case of the intake opening to the sea chest.

INEFFICIENCIES BEING EXPERIENCED BY THE EXISTING COMMERCIAL FLEET.

Tidal Conditions and Vessel Operating Difficulties.

Tides at the Bayou are diurnal, which means that vessels with drafts requiring water surfaces above MLW have one (1) opportunity per day to catch high tide and safely exit or enter the channel.

This constraint inhibits vessel operations throughout the year. Peak brown shrimping season occurs during June and July; the peak white shrimp season occurs during September and October; and the season for the harvest of finned fish is all year, as is shipbuilding. Vessels are delayed, damaged, or both damaged and delayed, on both exit and entry to the Bayou channel.

Tidal data (which includes not only astronomical tide, but also the effect of wind conditions on these tides) were examined for 40 years of record at Pascagoula Harbor, Mississippi, Mobile Harbor, Alabama and for 12 years of record at Biloxi, Mississippi. Of these gage records, the one at Biloxi, Mississippi appeared most representative of conditions experienced at Bayou La Batre (where there is no gage record). The gage at Biloxi is located on the old Mississippi Highway 90 bridge inside the area of Mississippi Sound. This gage was chosen as a better indicator of tidal conditions (as effected by winds) at Bayou La Batre since it is much less effected by significant levels of riverine flooding.

A frequency analysis of the Biloxi gage data was made and is presented in Table 8A. The table shows data for the percent of gage time tides equalled or exceeded selected heights above Mean Low Water (MLW) (1-foot, 2-foot, and 3-foot). The existing channel at Bayou La Batre is maintained to a depth of 12-feet below MLW, therefore a tide equalling or exceeding 2-feet above MLW provides an available navigation depth of 14 feet. The frequency data is shown for the entire 12 years of record and is also shown compared to data computed for the year 1986 (portrayed as typical by local channel users). Inspection of Table 8A reveals some seasonality to the availability of tide heights above MLW, and seems to generally indicate the 1986 data shows higher tides than the average tides for the 12-year period. Although the season from about December through April shows as providing a lower frequency of tides over MLW, it should be pointed out that water surfaces of this type occur every month throughout the year. This seasonality shown in the data seems to substantiate the local channel users indications that during the winter and early spring months sustained northerly winds suppress normal astronomical tides (both high and low).

Using tidal data from the Biloxi gage for the year 1986 (taken as a representative year) a graphic analysis of available depths at Bayou La Batre was made and is presented in Figures 4-15 at the end of this Appendix. Shown in these figures are a plot of actual (astronomical plus wind effects) tide for each day of each month through one full year. Also shown plotted in relation to the tidal heights are (from bottom to top): a line representing the channel bottom (at -12 foot MLW or -12.5 foot NGVD); a line representing MLW (at -0.5 NGVD); a line representing the tidal datum of zero NGVD; and several other lines representing increments of 1, 2, and 3 feet above MLW (or navigation depths of 13, 14, and 15 feet respectively).

TABLE 8A
Biloxi Gage Tidal Data

Percent of Time Tides Equalled or Exceeded Indicated Heights Above MLW*

	For Tides 1 ft above MLW		For Tides 2 ft above MLW		For Tides 3 ft above MLW	
	12 Years ($)	1986 ($)	12 Years ($)	1986 ($)	12 Years ($)	1986 ($)
January	93.5	83.9	26.5	19.3	1.3	0
February	82.1	85.7	30.6	50.0	3.9	0
March	88.3	100.0	38.1	41.9	7.6	3.2
April	94.6	100.0	40.8	70.0	3.4	0
May	98.1	100.0	60.6	80.6	8.2	19.4
June	99.6	100.0	62.2	70.0	8.8	13.4
July	97.9	96.8	48.1	51.6	4.2	0
August	97.3	94.4	46.0	61.1**	4.8	0
September	98.7	100.0	69.5	86.7	7.7	10.0
October	95.6	96.8	52.5	80.6	11.5	19.4
November	95.2	93.3	62.0	73.3	13.9	16.7
December	90.8	94.4	52.1	77.8**	5.6	0
Yearly Average	93.1	-----	55.2	----	6.9	----

* A depth of 2 ft above Mean Low Water (MLW) provides a navigation depth of 14 feet (12 ft below MLW + 2 ft). A water surface of 1.5 NGVD equals 2 ft above MLW.

**Gage inoperative for part of the month; percent was based upon days operative.

Source: U.S. Army Corps of Engineers, Mobile District, Hydraulic Data & Sediment Section (from USGS gage at Biloxi, Mississippi).

Inspection of the plots for each month reveal not only the high frequency at which a vessel could encounter inadequate navigation depths (both leaving or entering the Bayou), but also lengthy periods of consecutive days in which tides never reach the require height for vessel operations. Looking at Figure 4 (the first plot for the month of January 1986) and the line representing a 14 foot depth (or 2-foot above MLW), it is very obvious that vessels requiring this height of tide would incur serious problems.

Underkeel Clearances.

Information from shrimp vessel operators and consideration of wave conditions and vessel characteristics (squat, pitch, roll, and trim) indicate that in addition to the loaded vessel drafts, one foot of depth is necessary to avoid banging the channel bottom u[illegible]mal operating conditions. Ideally the operators of larger vessels [illegible]-foot loaded drafts and greater) prefer an additional foot of safety clearance (although not all operators at all times navigate under such a constraint). Combining these two requirements yields a total 2-foot underkeel, which also satisfies a need of additional depth over draft for maneuverability and avoidance of clogging water intakes on the bottom of the hull.

Most of the larger vessels in the Bayou are steel hulls with kort nozzles (circular steel plates around the propeller). These kort nozzles provide less maneuverability in shallow depths than traditionally powered vessels, but provide increased vessel speed and thrust for the same amount of fuel consumption. With an additional 2-feet below the keel (and kort nozzle) maneuverability is relatively the same as a traditionally powered vessel.

Vessel operators and shipbuilders also indicated that underkeel clearances of 2-feet are needed to avoid damaging systems which are located on the bottom of the hull (as previously described), but most importantly to avoid sucking silt or sand into the sea chest intake and seriously damaging the engines and refrigeration system.

The 2-foot of underkeel is desirable for all the reasons stated above and is consistent with Corps Guidance as stated in EP 1105-2-45, dated 6 August 1984; but a minimum of 1-foot is absolutely necessary under normal seas to avoid consistent vessel damage. With a 1-foot additional depth below the loaded draft, damage can still occur to vessel systems under abnormally rough conditions. Shown in Table 8B is a listing of the shrimp fleet by loaded draft, required and desirable navigation depths (with underkeel clearances considered).

TABLE 8B
Shrimp Fleet Serving Bayou La Batre
By Loaded Draft and Required Navigation Depths
(those with loaded drafts over 10 feet)

Loaded Draft (ft)	No. of Vessels	Navigation Required (1-ft underkeel)	Depths Desirable (2-ft underkeel)
11	24	12	13
12	101	13	14
13	4	14	15
14	12	15	(16)*
16	1	(17)*	(18)*

* With the existing channel and available high tides, these depths are never available at Bayou La Batre. The 16-foot loaded draft vessel cannot fully load when operating in the Bayou.

Consideration was given to the development of a risk-cost curve for vessel operations at the Bayou, which would attempt to show changes in income and operating costs as underkeel clearance is decreased and risk of vessel damage is increased. This type of analysis is performed to establish an "acceptable operational" underkeel clearance where risk-cost and income are balanced through light loading by vessel operators.

However, this curve could not be developed for vessels operating out of the Bayou for two reasons: (1) the vessel operators fully load (on exit and entry) and (2) no data exists on each vessel in the Bayou which would show correlations between the actual hours of delay, damage, and the date and time navigations are attempted. Without the date and time of incidents of damage, the exact tidal conditions, and therefore available underkeel clearances, can not be established.

Categories of Inefficiencies (Costs). Operational inefficiencies being experienced at Bayou La Batre are resulting in draft related costs in four categories: vessel delays, vessel damages, increased labor costs (opportunity cost of labor), and increased travel time.

a. Vessel Delays.

Field data indicated that the gulf vessel is equally weighted on exit and entry (fuel and water are decreased and catch is equally increased). Loaded drafts upon exit or entry, therefore, are essentially the same when the vessel captain is weighing the risk of navigating the channel on less than high tide. When trips occur during peak shrimping season, the monetary incentive to exit the Bayou hurriedly often overrides the known risk of damages to the vessel. The reverse would be true with the vessel loaded with shrimp upon returning to the Bayou. As can be seen from the daily tides in Figures 4-15, peak shrimping seasons have numerous occasions with consecutive days when tides are not available to safely navigate the channel. To catch a high tide with water sufficiently above MLW requires a timed return to port or a delay in leaving (both are a delay). The ability to time returns is also impacted by the fact that the length of time to fill the vessel with catch is different on every trip for every type vessel (i.e. there is no standard trip duration for any one selected vessel).

Field data also indicated that all shrimping vessels with loaded drafts of 11 feet or over incurred about 120 hours of delays annually and these delays were more frequent during the November through February time frame because of the more frequent number of occurrences with 2 or more consecutive days of depressed high tides. Each vessel makes an average of 6.5 trips during the winter months. The largest vessels (14-16 foot loaded draft) incurred delays of about 18.5 hours for each trip during these periods of consecutive days without tides high enough to navigate the channel safely. Since the tidal change is usually equally distributed over 12 hours, these tidal changes can be directly related to delays based on the draft of the vessels. For example, the 14 foot loaded draft vessels incurred an average of 18 hours delay each fishing trip (either exit or entry but not necessarily both) based on the absence of high tides. Therefore, a 13-foot draft vessel incurred 75 percent of the 18-hour delay, a 12-foot draft vessel incurred 50 percent of the 18-hour delay, etc. The economic costs of these delays were determined from the total variable operating costs per hour for the vessels, excluding the crew and captain's share. Based on the cost shown in Table 6, the variable costs are $84,982. As stated previously, the vessels make 18 trips per year lasting 14 days each. Based on multiplying the vessel trips per year (18) by the trip duration (14 days), the yearly activity level per vessel would be 6,048 hours. The delay costs of $14.05 per hour is derived by dividing the yearly variable costs ($84,982) by the number of activity hours per year (6,048). The computations of delays for each vessel draft are shown in Table 9.

TABLE 9
Vessel Delay Costs
October, 1986 Prices

Draft	No. of Vessels	Hour Delays Each Trip	No. of Trips a/	Total Hour Delay	Delay Costs Per Hour	Total Delay Costs
11	24	4.5	6.5	702	$14.05	$ 9,863
12	101	9.0	6.5	5,909	14.05	83,014
13	4	13.5	6.5	351	14.05	4,932
14	12	18.0	6.5	1,404	14.05	19,726
16 b/	1	18.0	6.5	117	14.05	1,644
Total						$119,179

a/ Throughout the year, but mainly during winter months.

b/ The 16 foot draft vessel was added to this data in February, 1987 (no data available on its operating costs, since it is a freezer processor); therefore, the data in Table 8 was used as a proxy.

b. Vessel Damage Costs.

Although damages occur throughout the year, occurrences of consecutive days without appropriate depth are more frequent during winter months due to astronomically normally lower low tides and sustained northerly winds which suppress both high and low tides. The occurrence of damages and delays to the vessel fleet is spread throughout the year, but are more intense during peak shrimping season. This is due to more frequent use of the channel and competition between vessels to maximize fishing time. It should be noted that the damages discussed below are in addition to the delays previously described. Damaging a vessel (especially when a propeller or shaft is involved) also results in delays. When a vessel operator has timed the return to port, but misinterprets the available depth, damages and delay both occur. The vessel was delayed by a slower timed arrival at port; and due to impatience or misinterpretation of available depth and wave effects, incurs damage also.

Based upon information obtained from vessel operators in 1986, 100 of the larger vessels sustained damages to shafts, propellers, rudders, hulls and a number of the aforementioned systems at/near the bottom of the vessel while using the Bayou La Batre channel. Of these, 66 vessels incurred damages averaging $4,800 each. One (1) 14 foot draft vessel incurred $10,000 in damages to its main propeller rudder and extensive damages to its hull. Two (2) of the 14-foot vessels also incurred consistent, monthly damages. The remaining 31 vessels incurred damages averaging about $2,600 each. Total repair costs in 1986 were $420,300, which are displayed in Table 10.

TABLE 10
Damages to Shrimp Vessels in 1986 by Vessel Draft
October, 1986 Prices

Draft (ft)	Number of Vessels	Average Damages Per Vessel	Total Damages
11	19	$ 2,405	$ 45,700
12	66	4,771	314,900
13	2	1,000	2,000
14	9	3,300	29,700
14	2	7,200 a/	14,400
14	1	10,000 a/	10,000
16	1	3,600 a/	3,600
Totals	100		$420,300

a/ Includes diver costs.

The likelihood of simultaneous damages and delays for a 12-foot loaded draft vessel (the prevalent size in this fleet) is further discussed. Based on the tide data in Figures 4-15, there were 36 occurrences in 1986 in which a 12-foot loaded draft vessel with a 2 foot underkeel clearance had to wait 12 to 168 hours to exit or enter the channel. Being fully loaded at exit (ice, fuel and supplies at exit are replaced with catch on re-entry), the vessel would wait a minimum of 12 hours which are the exact hours of the trough between the window of transiting opportunity of a decreasing peak diurnal high tide of one day to the same window of an increasing peak high tide on the next day, assuming no astronomical interference with peaks (northerly winds, etc.). At this point, the vessel has now been delayed a minimum of 12 hours; e.g., the depressed tides could last for several days. If the vessel captain reacts imperfectly to an imperfect weather forecast (sudden northerly winds with an already decreasing tide) and tries to exit, the vessel also incurs damages of the magnitude mentioned in Table 10. This risk-taking behavior of the captain becomes more acute upon re-entry back into the channel with the vessels' catch.

c. Diver Costs.

Based on field data collected in 1986, a number of the larger shrimp vessels have required professional divers to free propellers, check for hull damages and repair the vessel when necessary. Vessels drawing over 12 feet have incurred diver costs of about $45,000 dollars annually in total. Table 11 below indicates the reported diver costs for the various vessel drafts.

TABLE 11
Diver Costs by Vessel Drafts
October, 1986 Prices

Draft (ft)	Cost
11	--
12	$43,500
13	2,700
14	(see Table 10)
16	(see Table 10)

d. Opportunity Costs to Labor.

Opportunity costs to labor are "lost earnings" and are based on the average hourly wages the crew actually receives while shrimping. When a vessel is delayed, the captain and crew must work additional hours to receive the same annual salary. If the crew and captain were not being delayed, they have the opportunity to engage in other work. The value assigned to the other work is the same as the actual wages they receive on an hourly basis while shrimping. The value per hour for this time is based on the wages shown in Table 6 ($125,064) divided by the hours fished annually (6,048, or 18 trips x 14 days each x 24 hours per day). This computation results in an estimate of lost hourly wage of $20.68 based on the captain's and the crew's shares of the catch. Total hours delayed are those shown in Table 12, which indicates the benefits creditable to this category for each vessel draft.

TABLE 12
Opportunity Costs to Labor
October, 1986 Prices

Draft	Hours Delay a/	Value Per Hour b/	Value of Lost Opportunities
11	702	$20.68 c/	$ 14,517
12	5,909	20.68	122,198
13	351	20.68	7,259
14	1,404	20.68	29,035
16	117	20.68	2,420
Total			$175,429

a/ See Table 9.

b/ Based upon the average of all vessels in this fleet.

e. Additional Travel Time Via Petit Bois Pass.

Shrimp vessel operators traveling from Bayou La Batre to the open Gulf to shrimp directly south of Bayou La Batre prefer to use Petit Bois Island Pass since it is a shorter, more direct route. However, a shifting channel coupled with winds and strong currents have created unsafe operations for the larger vessels. Based on data submitted by vessel operators, Petit Bois Pass is unusable 70 percent of the time. In the absence of a safe passage through Petit Bois Pass, vessels must transit the Gulf Intracoastal Waterway and operate through either Horn Island (Pascagoula) Pass or Mobile Pass to travel to shrimp grounds directly south of Bayou La Batre. The vessel operators state that the use of either Pass represents an additional travel time of 1.5 hours per trip or 3.0 hours per round trip. The time spent operating via the alternative routes represent an inefficiency in vessel operation. While all vessels have some difficulty operating through Petit Bois Pass, vessels with loaded drafts in excess of 11 feet risk running aground with probable loss of catches, vessels and lives. Table 13 presents the costs associated with these additional travel times by vessel draft.

TABLE 13
Costs Associated with Additional Travel Time
October, 1986 Prices

Loaded Vessel Draft	No. of Vessels	Additional Travel Time Hours	No. of Trips a/	Total Hours b/	Total Cost Per Hour c/	Additional Travel Costs
11	24	3	5.2	374	$34.73	$12,989
12	101	3	5.2	1,576	34.73	54,734
13	4	3	5.2	62	34.73	2,153
14	12	3	5.2	186	34.73	6,495
16	1	3	5.2	16	$34.73	556
Totals	142					$76,927

a/ Adjusted to reflect possible use of Petit Bois Pass while shrimping due south of Bayou La Batre (18 trips yearly x 29% = 5.2). Otherwise, the vessel is headed due West or East, and Petit Bois pass affords no savings in distance traveled.

b/ Rounded.

c/ Fixed and variable operating costs.

Summary of Existing Condition Operational Inefficiencies. Table 14 below summarizes the total additional operational costs for the gulf fleet at Bayou La Batre using the existing 12 foot channel (12 ft below MLW).

TABLE 14
Existing Costs for Commercial Fishing Fleet Operations
at Bayou La Batre

October, 1986 Prices
($1,000)

Categories	Existing Costs (12')
Vessel Delays	119.2
Opportunity Costs to Labor	175.4
Vessel Damages	420.3
Diver Expenses	46.2
Additional Travel Time Via Petit Bois Pass	76.9
Totals	838.0

INEFFICIENCIES IN EXISTING BUTTERFISH FLEET OPERATIONS

General. For several years National Oceanographic and Atmospheric Administration (NOAA) and its fisheries research arm, National Marine Fisheries Service (NMFS) investigated the biomass and migratory patterns of butterfish (*Paprilus burti*) in the northern Gulf of Mexico for export and development of US markets. There is an established butterfish industry on the Atlantic coast of the US; butterfish have previously been considered a "trash" fish by Gulf fishermen; however, it is a highly valued species on foreign markets. (All underutilized species of fish in US waters are under study by applicable geographical fishery management councils to determine their potential development for domestic and foreign consumption.) During the fall of 1984 and Spring of 1985, NOAA's research vessel, "Chapman" and the Japanese research vessel, "Nisshin Maru" combined exploratory, cooperative efforts to trawl for butterfish in the Gulf. The results were surprisingly good. Based on their findings, the Spring season produced greater quantities of butterfish than the Fall season (up to 10 metric tons per hour).

By Spring, 1986, a joint effort between New England fish cooperatives, which own large freezer-processor vessels, and three (3) modified Gulf shrimp trawlers (one owned by Deep Sea Foods, Inc. of Bayou La Batre) further tested the viability of initiating and developing a butterfish industry on the northern Gulf of Mexico. These efforts produced predictions by NMFS that this industry would be extremely profitable. The projected annual income from butterfish found in the Gulf would be $19,000,000 in ex-vessel value, or an annual export value of $75,000,000 when sorted by size, packaged, frozen and shipped to Japan. 24/ There is an incentive for the seafood processor who owns the vessel to own the butterfish all the way to the Japanese markets, since large salted and dried butterfish during 1986 sold for $15 per pound in Japan. This was the strong incentive for the three (3) Gulf vessels to conduct the aforementioned tests. These vessels are minimum 12-foot loaded drafts plus another foot of squat from filling all holds with seawater-ice slush. This butterfish fleet used an alternative port, Pascagoula, Mississippi, to land their catch since adequate depths were available and guidance from the NMFS butterfish research team was located at Pascagoula.

Projected Annual Volumes of Butterfish. Research data from NMFS indicate that the projected biomass of butterfish in the northern Gulf ranges from 34,000 to 124,000 metric tons. The projected yield from this biomass could be as high as 47,000 metric tons annually. 25/ This projected annual yield could attract many transient vessels to the Gulf, since... "butterfish landings in 1984 from Maine to Virginia [an established industry] totaled 11,270 metric tons with a value of $6.62 million dollars. Potential for production in the northern Gulf of Mexico, is three to five times this figure, according to Andrew Kemmerer, director of National Fisheries Service Mississippi Laboratories at Pascagoula."26/ The biomass of butterfish in the Atlantic is 16,000 metric tons based upon data from NMFS officials at Pascagoula.

Butterfish Vessel Characteristics and Fishing Grounds. These vessels were freezer-processors with rigging which allow fishing up to 170 fathoms of water with processing and freezer capacities ranging from 100,000 to 300,000 pounds. The five (5) New England stern trawlers which participated in the above tests in 1986, ranged in sizes from 90'-140' in length, 26'-32' in breadth, 15' in loaded drafts, and freezer-processing capacities of 100,000 to 300,00 pounds. Generally, their processing equipment could sort the butterfish into four (4) sizes (super small, small, medium and large) and package the fish into "swim" packs of various size boxes depending on time between haulups. If time did not permit sorting between haulups the butterfish were "swim" packed without sorting (the older, less modern freezer processors were more apt to have slower, less accurate sorting equipment). The packaged butterfish were flash frozen and stored in the large freezer room aboard ship.

Three (3) Gulf shrimp trawlers with applicable modified rigging also participated in the Spring, 1986 test; dimensions of these averaged 90'-100' in length, and 12'-14' loaded drafts plus one extra foot of squat from filling all holds with seawater-ice slush and catch. Their catch was held in ice slush and sorted after docking.

The fishing grounds are located along and north of the 100 fathom contour in the GOM almost directly south of Mobile and Pensacola Bays (see Figure 16).27/ Bayou La Batre is strategically located for entry into and expansion of the butterfish industry.

Total and Average Catches (1986-1988). Based upon data from NMFS, Pascagoula Office, these eight (8) vessels fished May 7 through July 15, 1986. During May the vessels oriented themselves to the fishing area which had been identified by the joint US-Japanese venture (Figure 16). The average catch was 80,050 pounds per 8.67 days for 1986, which was their average trip length. The total catch for this first operation (1986) was 1,305,155 pounds. The 1988 season was highly successful (6 New England freezer processors and 10 converted Gulf trawlers of which one was from Deep Sea Foods, Inc.). Catch rates doubled/tripled, and the number of trips were six-fold, and trips were shorter in duration. See the *Confidential* addendum to this appendix for details of the sensitivity of Japanese prices for butterfish to their knowledge of US supplies of butterfish.

Possible Use of an Alternative Port. During both seasons (1986 and 1988), Deep Sea Foods, Inc. tried to use the Port of Pascagoula to land their butterfish catch since adequate depths do not exist at Bayou La Batre without light loading the vessels, and encountered the following operational problems at Pascagoula, which either or both precluded their use of this alternative port:

a. Dockside processing facilities were completely inadequate for processing the butterfish (some of the fish were sorted and swim packed, some were split, gutted and sideways packed, etc.) for meeting Japanese marketing demands of freshness and quality; and

b. Only one public freezer storage facility (a bonded warehouse) was available for storing and staging each catch for several months before increased demand in Japan brought the desired price for their butterfish (one private freezer storage facility would purchase the butterfish at dockside prices which was not suitable to Deep Sea Foods, Inc.). At the public facility (Port Authority of Jackson County), wharfage (docking) was charged the vessel, stevedores had to unload the vessel and bonded personnel only could stage the butterfish by size (small, medium or large) for sale in container loads. The freezer processor vessels could use this public storage facility since their catch was processed at sea.

The converted trawler of Deep Sea Foods, Inc. started the 1988 season in mid-July and will fish possible until late November (peak season was predicted to be February to May in 1985/1986). Fully loaded, the vessel is expected to haul 50,000 pounds; light loaded 1 to 1.5 feet, the catch will decrease by 7,000 to 10,000 pounds (with light loading 1.5 feet, the vessel has incurred extensive delays and some damages and diver costs in 1988). Seven (7) trips have been made in 1988 with lengths of 2 to 4 days each with excellent catches, and the company does not yet have adequate vessel operating data to compute average operating costs for an average trip (catch) during the 3 seasons (spring, summer and fall) in order to assess the costs of operating the vessel light loaded. However, based on prices paid for export U. S. butterfish (see Table 15) during the period 1981-1987 ($.857), the costs for light loading could be substantial ($1,028,400) assuming annual trips of 120 (10 months/2.5 days per trip) with 10,000 pounds per trip light loaded.

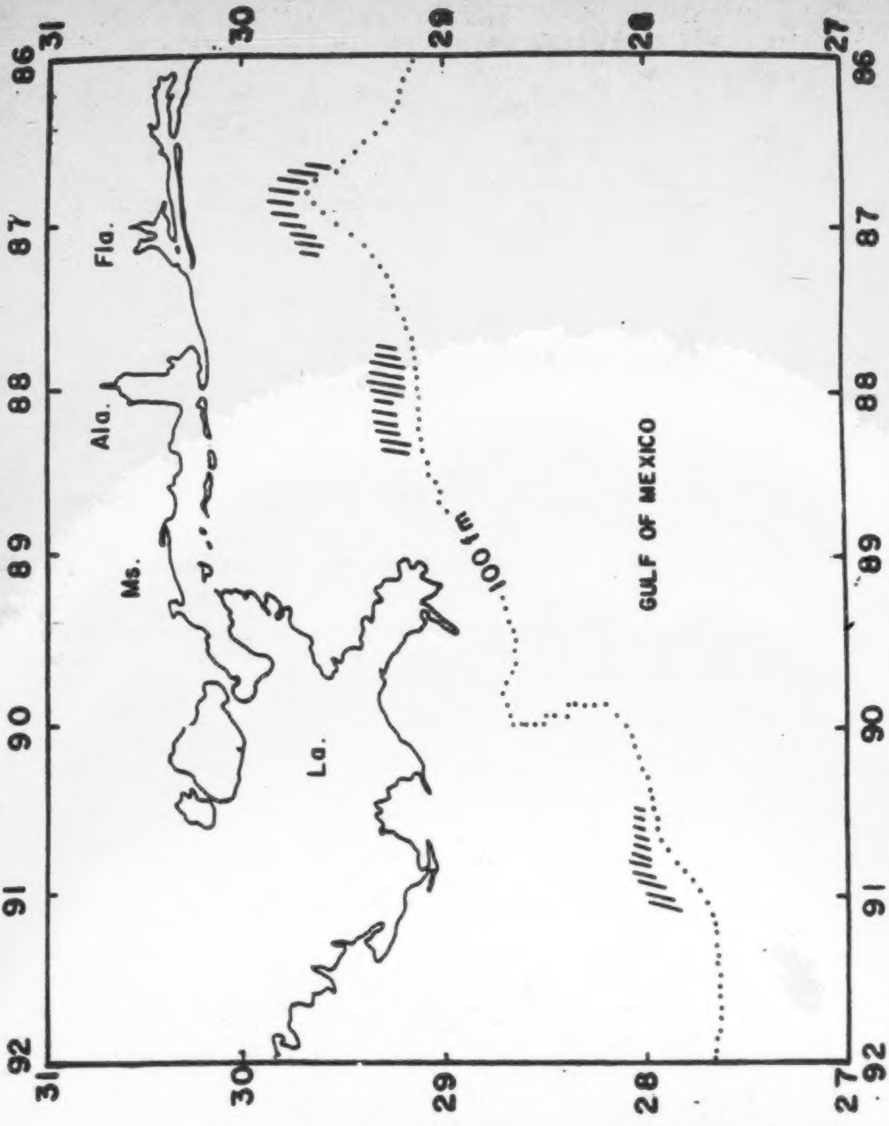


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FIGURE 16
Butterfish Grounds in Gulf of Mexico

Source: Commercial Vessel Activities, Technical Memorandum on 1986 Inital Commercial Butterfish Venture in the Northern Gulf of Mexico (DRAFT), NOAA, NMFS, Pascagoula, MS, February, 1987.

Table 15
US Landings and Export of Butterfish (1978-1987)

	Million lb.		$ Price/lb.	
	Landings	Exports	Ex-Vessel	At US Port a/
1978	8.1	5.3	0.36	0.66
1979	6.1	0.4	0.34	--
1980	11.6	9.8	0.33	--
1981	7.8	4.4	0.33	0.70
1982	17.7	13.9	0.32	0.74
1983	10.6	4.8	0.31	0.82
1984	26.0	16.6	0.27	0.69
1985	10.3	n/a	0.34	--
1986	9.9	2.2	0.67	0.81
1987	10.3	7.6	0.63	1.38

a/ Value at US export port, based on selling price excluding inland freight, insurance and other charges.

Source: Gulf & South Atlantic Fisheries Development Foundation, Inc.

Bycatch of Other Species. Several highly marketable species of fish (herring, squid, scad, tuna, etc.) are also being caught in the butterfish nets and are being processed, packaged and marketed from Deep Sea Foods, Inc. As of June, 1988, this company has sold foreign and domestic consumers several thousand pound of these new species in processed form.

Summary of Costs. During 1986 and 1988, Deep Sea Foods, Inc. has landed several hundred thousand pounds of butterfish at Bayou La Batre on light loaded converted trawlers at unknown additional costs to this channel user. Therefore, since the butterfish industry is in a testing phase, additional costs for butterfish operations at Bayou La Batre for Existing Condition is not available. See data presented in previous paragraphs, and see Confidential addendum to this appendix for the reasons for non-disclosure of related data.

INEFFICIENCIES IN THE DEVELOPING SIMULATED SEAFOOD INDUSTRY

General. Simulated seafood, or "surimi," is a block of pure fish protein in jell (frozen) form, which can be processed into a shrimp-, crab-, scallop-, or lobster-flavored product with the addition of meat from other shellfish species. Atlantic croaker (Micropogonias undulatus) and white trout (Cynoscion arenarius) were expected in 1986 to comprise the largest portion of the raw materials required in this new industry on the Gulf Coast. This process is a Japanese invention; the potential for consumption in the U.S. is quite high. For example consumption in the U.S. has risen from 9.0 metric tons in 1979 to 40,000 metric tons in 1984, all of which was imported from Japan. 28/ Acceptance of this product in the U.S. is expected to accelerate rapidly which will provide opportunities for increased revenues for the seafood industries in the U.S.

Simulated Seafood Industry at Bayou La Batre. In 1980, Deep Sea Foods, Inc. of Bayou La Batre created a separate corporation, Nichibei Fisheries, Inc., as a research group which conducted a pilot program to develop surimi in the U.S. The program continued for 5 years with technical assistance from California and Japanese interests and under the direction of the NMFS (as a joint venture between Deep Sea Foods Inc, Deep Sea International Inc, and JAC Creative Foods of Los Angeles, California). The products were tested in Japanese markets and passed their standards for excellence. As a result of these efforts, a major U.S. surimi production corporation has been formed between Deep Sea Foods, Inc. and its Japanese corporation called JAC Creative Foods of Los Angeles, California. Deep Sea Foods, Inc. built a new surimi processing plant at Bayou La Batre at a cost of $2,000,000 in late 1987 which has a 24 million pound processing/freezing capability annually. This plant was partially operational in 1987.

Projected Operational Characteristics. The plant owners projected in 1986 that one-half the plants' production would come from pure surimi protein jell imported from Japan which would be trucked from their Los Angeles plant and flavored with products (shrimp and crab) caught and landed at the Bayou. The other 12 millions pounds of surimi would be produced from raw materials (fish) caught in the Gulf in the freezer processors to be used in the butterfish industry. By June, 1988, the preliminary testing of the Gulf species have been found to be unsuitable, since these warm water, soft meated species do not produce the high grade of surimi as does cold water, firm meated species (pollock, etc.).

THE SHIPBUILDING INDUSTRY AT BAYOU LA BATRE

General. Based upon the 1987-88 Alabama Directory of Mining and Manufacturing and a 1986-1987 field survey by MDO personnel, 700 to 1,000 employees are employed at Bayou La Batre in the shipbuilding industry. These employment figures are shown in this manner in order to reflect the fluctuations of employment in this industry (low to high). Specifically, between the construction of ships, some of the craftsmen may also crew (or captain) a shrimp trawler for himself or the shipbuilder for whom he works as a craftsman. In terms of total employment, shipbuilding is second only to seafood processing in the area.

Company names and type of hull construction and/or repair at each shipyard are listed below in order of their location along the channel from the mouth of the channel landward:

Horton Boats, Inc.	Steel
La Force Shipyard	Steel
Master Marine, Inc.	Steel
Frank Johnson & Sons-Shipbuilding	Steel
Ocean Marine, Inc.	Steel
International Shipbuilders, Inc.	Steel
Gazzier Shipbuilding, Inc.	Steel
J & S Fabricators	Steel
Offshore Trawlers, Inc.	Steel
Deep Sea Boat Builders, Inc.	Steel
Herbert Boat Repair, Inc	Wood/Steel
Zirlott Boat Yard	Steel
Randall's Boat Repair	Steel
Rodriquez Boat Builders, Inc. Repair Yard	Steel
Steiner Shipbuilding, Inc	Steel
Landry Boat Works, Inc	Wood
Angus Marine, Inc.	Aluminum

These 17 shipyards constructed approximately 1100 vessels for domestic consumption from 1975-1986 and approximately 250 vessels during the same period for foreign consumption. Most of the vessels constructed for foreign consumption were built during the last four years of this period.

Fourteen of the seventeen shipbuilders are direct descendants of native fishermen, shrimpers or shipbuilders of Bayou La Batre. Specifically, they are, in many cases, third/fourth generation natives who have learned the shipbuilding industry from their fathers/grandfathers. In almost all cases, they continue to own and operate shrimping vessels (even fleets of vessels) so that the level of knowledge required to design vessels based upon the latest fishing/shrimping technology is continually current. Several of these shipbuilders are presently serving on national fishing technology advisory groups/boards in order to insure that the U.S. fishing/shrimping industry remains highly competitive with foreign countries.

Twelve (12) companies are located along the Bayou La Batre federal channel; two (2) companies are located on Snake Bayou, a tributary to the federal channel; and three (3) shipyards are located on the Bayou, but above the existing Federal project. The analysis of a federal project for Snake Bayou and extending the existing channel above the Highway 188 Bridge shall be discussed after the analysis of potential deepening and/or widening of the existing federal channel.

INEFFICIENCIES IN EXISTING SHIPBUILDING OPERATIONS

Existing Operations. The existing channel dimensions are 12' x 100' up to the turning basin (2.6 acres) and then a channel 12' x 75' up to the Highway 188 bridge. On an annual basis, the seventeen shipbuilders construct an average of 150 vessels and repair an average of 750 vessels based upon field data gathered in late 1986, 1987 and early 1988. Representative annual data is 1986 operations for most shipbuilders at Bayou La Batre; however, some builder's data were averaged over the previous 5-year period, or 1988 confirmed contracts were used as a basis of projecting operations.

The Bayou La Batre shipbuilding industry underkeel clearances of the newly constructed, repaired, or converted vessels during launch and sea trials are 2 feet--1 foot for squat, roll, pitch, and trim and 1 foot for maneuverability and protection of the water intake systems at or near the keel. These shipbuilders are waiting for high tide to launch, seatrial and deliver their vessels. But to maximize profits, the shipbuilders are taking risks to minimize delay time. This behavior to avoid delays waiting for high tide can be two-edged--damages to the vessel and increased construction and/or delivery costs (there is almost always a penalty clause for late delivery in the contract). If the decision to launch or seatrial the vessel without enough depth is made and the vessel is damaged, the original delay is then compounded into production/scheduling delays for the remainder of the vessels in production at that time. This produces a much greater cumulative cost inefficiency than that incurred for just the vessel which was damaged. The risk of reverberating scheduling problems generally compels the shipbuilder to launch, seatrial and deliver the vessel on the highest tide available without undue delay time. Many of the shipbuilders launch their vessels at night with the crews on overtime to avoid damages, even though the vessel has its shallowest draft at launch. More equipment and systems are added for each seatrial, and the draft of the vessel increases until it is fully loaded upon delivery. During each of these steps, the delays waiting for high tide for several consecutive days, particularly during the winter months in which northerly winds suppress already lower than normal tides, compound the risks of damages and ultimately compound production delays. Reference is made to the tidal data previously presented. It is important to stress that costs shown herein for delays and damages have not been double counted. These are additional vessels to those used in the commercial fishing analyses. Several shipbuilders enumerated their damages (which were rather high), but were reluctant to quantify an amount for delays. Their standard response was that delays were a cost of doing business on the 12-foot channel.

Three (3) shipbuilders were splitting the construction of vessels between their yard at Bayou La Batre and another rented yard with limited production space and a deeper channel at Pascagoula or Mobile. Extra crew travel and lodging, logistics of moving heavy equipment to/from the rented yard, and reworking /reoutfitting the already outfitted hull which was launched at Bayou La Batre, etc., reduce profit margins for these shipbuilders. But this does not preclude them from being the lowest bidder on contracts for vessels much larger than the largest stern trawlers (freezer processors) built at the Bayou. Their skeleton hulls consistently draft 12 or more feet upon launch; thus, experiencing extensive delays waiting for high tides , as well as extensive damage to rudders, propellers, hulls, and engine systems. It should be noted that these large vessels draft 15 to 16 feet upon completion when fully loaded. Also the shipbuilder's bid price includes extra costs for renting another yard with a deeper channel for annual maintenance of these vessels. Even with these extra costs, the Bayou La Batre shipbuilder is highly competitive with other yards (to include foreign builders such as the Japanese).

The available skilled labor, technological innovation through shipbuilding and fishing, and land investment infrastructure at Bayou La Batre prevents the shipbuilders from moving their yards to other places with deeper channels. All of these factors create the highly competitive shipbuilding, conversion and repair industry on this channel.

In summary, inadequate channel depths (particularly during winter months) are reported to be the primary cause of delays and damages to the shipbuilding industry along the Bayou. Data supplied by the shipbuilding industry, by shipyard, is confidential in nature and is provided under separate cover for technical reviewers only. The following table is a summary of existing costs incurred by the industry from lack of adequate channel depths.

TABLE 16

Summary of Costs Incurred by the Shipbuilding Industry located on the Federal channel at Bayou La Batre

October, 1986 Prices
($1,000)

	12 - FOOT CHANNEL			
	DAMAGES	DELAYS	SPLIT OPERATIONS	TOTAL
Reach 1 (3 Shipyards)	0	24.0	0	24.0
Reach 2 (2 shipyards)	0	13.8	0	13.8
Reach 3 (4 shipyards)	210.0	110.2	978.7	1,298.8
Reach 4 a/ (4 shipyards)	100.0	48.0	0	148.0
Reach 5 (3 shipyards	2.7	2.5	0	5.2
Reach 6 b/ (3 shipyards)	--	--	--	--
TOTALS	312.7	198.5	978.7	1,489.8

NOTE: These data include 2 shipyards which were not operational in 1986 and 3 shipyards which started operations in 1986. Four (4) of these 5 shipyards had no additional costs in 1986.

a/ The costs for 2 of these shipyards are related to lack of channel depths in Snake Bayou, not on the Federal channel, and are not included in these figures.

b/ The costs for these 3 shipyards are related to lack of channel depths on the main channel above the Hwy 188 bridge, not on the Federal channel.

ADDITIONAL COSTS AT SNAKE BAYOU AND ABOVE THE HIGHWAY 188 BRIDGE

Existing Costs to Shipbuilders on Snake Bayou. Snake Bayou joins the main channel on the western side of the turning basin. There are two (2) seafood processing plants and three (3) shipbuilders which use this side channel. The fleet of vessels which use these seafood processors are bay shrimpers which draw 3' to 7' of water. A shipbuilder (repair yard) is located at the most northwestern end with 7 to 8 feet of water and has an annual operational loss of $119,250 from vessel damages and delays.

A shipbuilder is located at the mouth of Snake Bayou on the northern side and experience an additional annual operational cost of $113,200 resulting from damages and delays. This area usually has 12 feet of water, which is maintained by this shipbuilder. Another shipbuilder has haulout ways on the south side of Snake Bayou at the mouth and incurred delays in the amount of $77,895 annually.

Existing Costs to Shipbuilders on Main Channel Above Bridge.

Three shipbuilders operate above the Highway 188 Bridge with a 12-foot channel which is maintained by the city and incur additional operational costs annually amounting to $110,200, $252,900 29/ and $125,200, or $488,300 in total. A seafood processing plant with its fleet of vessels and numerous other private trawlers utilize this portion of the main channel; however, none of these latter vessels need greater than a 12-foot channel above the bridge.

Summary of Existing Cost Inefficiencies at Snake Bayou and Above Highway 188.

Table 17 summarizes the additional costs to these six (6) shipbuilders based upon their locations (Snake Bayou or above the bridge).

SUMMARY OF EXISTING CONDITION COST INEFFICIENCIES TO ALL INDUSTRIES

Table 18 displays the economic costs from inefficient operations to each industry in the order of their presentation in the preceding paragraphs.

TABLE 18
Summary of Existing Costs
For all Industries on the Federal Channel at Bayou La Batre, AL
October, 1986 Prices
($1,000)

	Existing Costs (12')
Commercial Fishing Fleet	838.0
Butterfish Industry	not available
Simulated Seafood Industry	0
Shipbuilding Industry a/	1,489.8
Other Shipbuilding b/	798.5
Total	3,126.3

a/ These data exclude costs for 2 shipbuilders on Snake Bayou and 3 shipbuilders above the Hwy 188 Bridge.

b/ These data include shipbuilders on Snake Bayou and above Highway 188 Bridge ($310.2 + $488.3 = $798.5. See Table 17).

FUTURE WITHOUT-PROJECT CONDITION

General. This portion of this appendix shall portray how each industry in the Bayou will respond to growth opportunities in the future in the absence of a federal project. This is called future "without-project condition". The period of analysis is 50 years from 1991, which would also be the economic life of a deepened channel. The purpose of this analysis is to capture changes in income streams to the commercial fishing fleet, butterfish industry, simulated seafood industry, and the shipbuilding industry which can be expected in the future without any modification to the existing Federal project for Bayou La Batre.

Since the Bayou La Batre area is considerably developed by fishing interests, seafood processors and shipbuilders, the behavioral choices pertaining to activities which may be taken in the absence of a deeper channel are important in defining a sound Without-Project Condition. The without-project economic setting is portrayed through defining the future use of the channel by vessel operators and shipbuilders. The behavioral responses to inadequate channel depths are depicted as resulting in operational inefficiencies, damages and delays. Vessel owners and operators and shipbuilders are willing to accept a certain level of risk in using the existing 12-foot channel for vessels requiring greater safe operating depths. In the absence of a deeper channel, choices have been made by shipbuilders to split their operation (particularly vessel construction) to capitalize on the economic advantages of the existing labor/technology infrastructure, but at an increased inefficiency. Commercial fishing interest have chosen to fully load large vessels and operate using available high tides, but again at some costs resulting from damages and delays.

The Future Without-Project Condition operational patterns and projections of growth for each of the industries previously discussed under the Existing Conditions are presented in the following paragraphs.

Commercial Fishing Fleet. There is ample evidence that growth is expected in the future in both the demand for and supply of seafood products from Bayou La Batre.

Growth in Demand. U. S. demand for fish and shellfish is increasing much faster than the ability of the U. S. commercial fleet to supply the need. Reported statistics indicate that per capita consumption of edible fish and shellfish in the U. S. has grown 30 percent since 1960 30/. Of the total U.S. consumption only 41 percent is landed by U. S. commercial fishermen 31/ with 8 percent landed by noncommercial U.S. fishermen, and the remaining 51 percent imported from foreign countries. Although U. S. consumption of seafood is increasing, numerous European and Far East countries have 300 to 500 percent greater per capita consumption of fish and shellfish than the U. S. 32/ This increased U. S. demand has been brought about for two (2) reasons:

a. Increasing dietary awareness, and education in the U. S. on the value of low fat/high protein levels of fish and fish related products in a diet; and

b. Increasing levels of fishing technology (harvesting and processing) in the U. S. 33/

Growth in Markets. There are numerous indicators that Bayou La Batre is a dynamic and growing seafood industry and has increased its markets for seafood products in both the U.S. and foreign countries.

First, their seafood processing capability is the largest concentration on the entire Gulf Coast 34/ and continues to grow (reference the 24.0 million-pound capacity surimi plant which was completed in 1987). The 57 processing plants/houses at the Bayou are annually operating at approximately

TABLE 17
Summary of Existing Operational Costs to Shipbuilders on Snake Bayou and Above the Highway 188 Bridge
($1,000)

	Existing Approximate Channel Depth	Existing Costs Damages	Existing Costs Delays	Existing Costs Split Operations	Existing Costs Total
Snake Bayou					
1 Shipbuilder a/	12 feet	13.0	100.0	0	113.0
1 Shipbuilder b/	12 feet	0	77.9		77.9
1 Repair Yard	6-8 feet	19.3	100.0	0	119.3
Total		32.3	277.9	0	310.2
Above Hwy 188 Bridge					
1 Shipbuilder	12 feet	19.6	233.3	0	252.9
1 Shipbuilder	12 feet	105.1	20.1	0	125.2
1 Shipbuilder	12 feet	0	110.2	0	110.2
Total		124.7	363.6	0	488.3

a/ This shipbuilder's facility is approximately 100 feet from the present turning basin.

b/ This shipbuilder's haulout ways is approximately 50 feet from the present turning basin.

55 percent capacity based upon data from the Alabama Sea Grant Advisory Service 35/, which means that more than 50 percent of the existing capacity is available for increased production after adding the capacity of the new surimi plant.

The shrimping industry in the Gulf of Mexico (GOM) is the largest in the U. S. in terms of landings; average annual landings in the GOM comprised 76 percent of the total U. S. landings of shrimp during the period 1980-1986. 36/ The value of the annual GOM shrimp landings approached $1.5 billion dollars in 1986 using the value-added processing rate found at Bayou La Batre (see Table 5A). Any future growth of this industry would, then, be linked to the supply of shrimp in the GOM.

The available supply (maximum probable catch) of shrimp in the (GOM) has been estimated by the GOM Fisheries Management Plan and is 301.7 million pounds annually, exclusive of 44.8 million pounds apportioned for recreational, bait and discarded shrimp. Based upon the trend line in Figure 2, this supply level will be reached in the year 2001, at which time it will level off and remain constant to the end of project life, or the year 2041. This is a 1.91 percent growth rate from 1988 to 2001.

Growth in the Fleet Size. The sizes of vessels comprising the commercial fleet at Bayou La Batre have been increasing faster than the remainder of the Gulf of Mexico fleet. The Bayou La Batre fleet increased from 56 to 73 net tons per vessel during the period 1970-1980, while the GOM fleet increase from 55 to 60 net tons per vessel over the same period processors. 37/ Field data collected by MDO researchers revealed that 5 to 7 large vessels have been added to the Bayou fleet during the summer of 1987 which were in excess of 100 net tons (90 to 100 feet in length; and 12 to 14 feet loaded drafts).

In terms of the number of vensels in the fleet, the Bayou La Batre fleet grew from 369 vessels in 1970 to 534 vessels in 1980, 38/ and subsequently fluctuated to 504 vessels in 1986 based upon our MDO field survey (similair data is not available for the GOM fleet). In summary, the Bayou fleet is relatively stable in number; however, the vessels themselves are rapidly increasing in size. The necessity to travel such long distances (to Louisiana, Texas and southwestern coast of Florida) and preserve their catches for longer periods of time would account for increasingly larger vessels appearing in the Bayou fleet.

Growth in Fleet Operational Costs. Based upon the growth projections discussed in the preceding paragraphs for the fleet and catch, the Future Without Project Condition operational costs are likewise projected to increase 1.91 percent annually to the year 2001 and thereafter remain constant to the year 2041. This growth in operational cost is based upon the premise that the average size of vessels within the existing Bayou La Batre fleet mix will increase (distribution tending to the longer sizes), and therefore will have longer delays and greater damages as they operate on the existing 12-foot channel. Table 19 presents these losses for the commercial shrimping fleet for Future Without-Project Condition by category and gives their average annual equivalent costs. Each of the other industries' operational costs are discussed in subsequent paragraphs following Table 19.

Future growth in operational inefficiencies/costs of the commercial fishing fleet were discounted to present worth and then amortized over the project life (1991 to 2041) at the FY 1988 interest rate of 8-5/8 percent using a computer program which uses a straight-line interpolation between data points. For the commercial fleet, a 1.91 percent annual growth rate to 2001 with no growth projected thereafter was used based on the trend of growth in the maximum sustainable shrimp catch in the Gulf of Mexico and resultant increases in vessel sizes. This same discounting and amortization procedure was used for the other industries and shall be described in subsequent paragraphs.

TABLE 19
Average Annual Equivalent Operational Costs for Commercial Fleet at Bayou La Batre
WITHOUT-PROJECT CONDITION
October, 1986 Prices ($1,000)

Category	Existing Costs a/	1991	2001	2041	AAE b/ Costs (1991-2041)
	(1986)	(1.11955)	(1.35141)	(1.35141)	
Vessel Delays	119.2	133.4	161.1	161.1	151.3
Opportunity Costs to Labor	175.4	196.4	237.0	237.0	222.7
Vessel Damages	420.3	470.5	568.0	568.0	533.6
Diver Expenses	46.2	51.7	62.4	62.4	58.6
Additional Travel Time via Petit Bois Pass	76.9	86.2	103.9	103.9	97.6
Totals	838.0	938.2	1,132.5	1,132.5	1,063.9

a/ See Table 14.

b/ AAE = "Average Annual Equivalent" (50 years at 8-5/8 percent interest).

Butterfish Industry. It is expected that the butterfish industry will become a growth industry on the Gulf Coast February through November each year. This is based upon the results of research and teaching efforts of the NMFS Research Labs at Pascagoula, Mississippi. In May, 1988, NMFS representatives at Pascagoula report that there were 10 large converted shrimp trawlers and 6 New England freezer processors fishing for butterfish in 1988. The catch rates for these freezer processors have doubled or tripled and the number of trips are six-fold over the 1986 conditions previously described. Deep Sea Foods, Inc., of Bayou La Batre converted their largest trawler to a butterfish boat for the 1988 season. The kind of butterfish boats expected to operate out of the Bayou will be converted shrimp trawlers until 1991. Thereafter, the freezer processors of the sizes used on the East Coast and now operating out of Pascagoula will become dominant in butterfishing from the Bayou. This prediction is based on the economies of scale of the freezer processor compared to a converted trawler. Under optimal conditions, a modern freezer processor can catch, sort, package and freeze 300,000 pounds of butterfish at sea in sorted "swim" packs in 5 days at an ex-vessel value $180,000 per trip or $10,800,000 annually (60 trips, February-November; see Confidential data, August 22, 1988 price quotations). The converted trawler can catch 50,000 pounds per trip worth $30,000 in 2.5 days at the same ex-vessel value or $3,600,000 annually at slightly less operating costs per trip than the freezer processor (120 trips compared to 60 trips for the freezer processor). Even if more value can be added to the butterfish with extra dockside processing and a higher price per pound can be obtained for the entire catch of the converted trawler, the economies of scale of the larger modern freezer processor will dictate their use through Pascagoula, Mississippi under future without project condition at additional operating cost as discussed below. Therefore, the number of freezer processors and their expected catches at Bayou La Batre in the future are described below.

On the East Coast approximately ten (10) freezer-processor stern trawlers dually fish butterfish and other species. The estimated East Coast annual biomass of butterfish is 16,000 metric tons with an 11,000 metric ton annual yield; therefore, it is expected that 20 freezer processors will fish the 34,000 (minimum) metric ton yield in the Gulf of Mexico (estimated range of butterfish biomass is 34,000 to 150,000 metric tons). If all the major shrimp ports along the Gulf of Mexico were to share this fleet proportional to their shrimp processing market share, three (3) freezer processors would be homebased at the Bayou. This projection is consistent with the Bayou's market share of the Gulf of Mexico shrimping industry (42.5 million pounds of shrimp processed out of 301.7 million pounds available, or .14 x 20 vessels = 2.8 vessels). It is estimated that their future catches will closely match their 1988 catch rates, vessel trips and trip lengths but limited to the 1986 season length of February to May. Accordingly, three processors would catch 9,606,000 pounds of butterfish during an average season (90 days divided by 4.50 days per trip = 20 trips x 160,100 lbs/trip x 3 vessels). The butterfish will have been processed at sea on the freezer processor vessel. Since the vessel cannot come into the Bayou without deeper channel depths and better channel availability, the processed catch would be unloaded at Pascagoula, Mississippi resulting in an extra $.0.13 per pound cost to vessel owner as described in Table 20.

TABLE 20
Comparison of Additional Costs Per Pound to Deliver/Hold Butterfish Catch at Pascagoula, Mississippi versus Bayou La Batre (Vessel: Freezer Processor)

Extra Costs	Pascagoula	Bayou La Batre
Wharfage a/ & stevedoring b/	$ .05	$ .00
Cold storage c/	.05	.00
Containerized trucking to Mobile d/	.05	.02
Crew/vessel cost to BLB e/	.00	.01
Extra fuel/provisions costs in Mississippi	.01	.00
Total	$ .16	$ .03

a/ Wharfage = vessel dockage fee
b/ Only bonded personnel can put the product in the facility.
c/ Only bonded personnel can stage the product for shipment.
d/ Closest container port
e/ Foregone crew/captain earnings and extra vessel fuel consumed for the vessel to travel from the juncture of the GIWW-E/Pascagoula channel to BLB.

The extra cost per pound to land the butterfish catch at Pascagoula compared to landing at their own plants at the Bayou would be $.13, which amounts to $1,248,800 annually. These freezer processors draw 15 feet of water loaded and must have 2 feet of underkeel clearance as previously discussed in this text. This results in a required navigation depth of 17 feet, which is never available at Bayou La Batre, even under extreme high tidal conditions.

As previously discussed, bringing the butterfish vessels into Bayou La Batre would be more efficient than porting at Pascagoula. Freezer capacity and existing labor resources now available in the Bayou could be more fully utilized, and overall handling requirements reduced. Butterfish will be sized, packed into small boxes, and frozen on the freezer processor vessels while at sea; but, there are additional logistical requirements involved in the marketing of the product to foreign brokers, that make operation from Bayou La Batre more efficient. The boxed and frozen butterfish are accumulated in the freezer warehouses and sorted by size (grade) after each vessel trip. The largest sizes are more desirable in Japanese markets and are sold first early in the season; as demand adjusts later in the season smaller sized fish are sold to the foreign buyer. These wholesale lots are by size and consist of container loads for shipment to Japan.

Simulated Seafood Industry. MDO researchers found no reason to forecast any economic growth for surimi at this time under the Without-Project Condition.

Shipbuilding Industry. Based upon increased world and U.S. demand for seafood products mentioned in previous paragraphs, fishing technology is expected to improve to meet this demand. These changes in fishing technology are already emerging with freezer-processors (stern trawlers), which allow longer fishing trips with increased capability of the vessel to hold larger refrigerated loads and to process products aboard ship. In other nations where fishing technology contributes a larger share of their gross national product (GNP), these freezer-processors are not only larger, but serve as a "factory" for a fleet of fishing vessels. 39/ It is anticipated that the fishing industry in the Gulf of Mexico will follow trends which exist on the East Coast of the U.S., which means that stern trawlers will not become "factory" vessels serving many auxiliary vessels, but will be processors of their own catch. 40/ However, the shipbuilders at Bayou La Batre are not limited to the level of fishing technology on the Gulf of Mexico. They are breaking into, and in several cases, controlling the shipbuilding trends in foreign markets where fishing and fishing technology are growth industries. 41/ (In support of this conclusion, four (4) Bayou La Batre shipbuilders who chose to list their deliveries of vessels in 1986 with The Fish Boat, the following numbers of vessels were delivered to foreign countries: 12 to El Salvador; 11 to Honduras; 11 to Nigeria and 2 to West Africa; or, 80% of their production was for foreign customers.) The eleven (11) vessels delivered to Nigeria by Ocean Marine, Inc. under Existing Condition were semi-freezer processors, or trawlers with larger freezer space and processing capabilities.

To summarize the demand for worldwide shipbuilding, there is an increased demand for more and larger fishing vessels. This increased demand for new construction and conversions of various types of vessels includes vessels for the U.S. military and other governmental agencies (U.S. Coast Guard, Navy, NOAA, etc.). Shipbuilders at the Bayou will continue to split their construction operations for vessels with drafts greater than those available currently in the Bayou. The result of future split operations is increasingly higher production costs, and some future loss of competitiveness in the world market for larger vessel bidding.

Demand is not the only reason Bayou La Batre shipbuilders will experience growth in the future. The other major reason these shipbuilders can expect continued growth is that they have three (3) competitive advantages over the other medium- and larger-sized shipyards in the U.S.:

1. Multi-skilled, non-union [illegible] across skill lines and construct vessels 20 percent faster and 30 percent cheaper since they report to only one (1) layer of management--the owner; and

2. Continued hands-on experience in developing fishing technology in the U.S. (ownership of fleets of fishing vessels and service on national fishing advisory boards by shipbuilding management).

3. A proven record of producing a quality product at a competitive price. Thirty-five (35) percent of the 150 newly constructed vessels in 1986 were for foreign consumption and were from 90 percent repeat or referred customers as evidenced by shipbuilding news articles.42/ Based upon field data, most of the remainder of the vessels built annually (domestic consumption) are also from repeat or referred customers.

In summary, Bayou La Batre shipbuilders forecast that they will double the number of vessels built over the 50 year without-project period of analysis. Accordingly, they will incur increasing amounts of damage and delay during launches, sea trials and deliveries since more vessels will be built and these vessels will be progressively larger in size. Their competitive posture will entice them to bid and win contracts for vessels which will require further split operations (construct the hull with a 12-foot channel and then outfit, test and pull required maintenance on the loaded vessel at another location) at larger costs to these shipbuilders. It is felt that over the period of analysis, the shipbuilding industry at Bayou La Batre will have incurred cost inefficiencies equal to double their existing costs by the year 2041. This represents a 1.4 percent growth in cost inefficiencies annually over 50 years.

SUMMARY OF FUTURE WITHOUT-PROJECT CONDITION COST INEFFICIENCIES FOR ALL INDUSTRIES.

No growth was projected for the surimi or butterfish industries under the Without-Project Condition. However, growth was projected for two industries, commercial fishing for shrimp and shipbuilding. A 1.91% annual growth in the amount of shrimp landed was projected to the year 2001, with no growth beyond year 2001 up to the year 2041. For the shipbuilding industry a 1.4 % annual growth was projected in operational cost inefficiencies. Table 21 summarizes the Future Without-Project Condition operational cost inefficiencies for continued commercial use of the existing Bayou La Batre Channel.

TABLE 21
Summary of Without-Project Condition Average Annual Equivalent Operational Cost Inefficiencies at Bayou La Batre
(October, 1986 Prices)

	Total Costs (12') ($1,000)
Commercial Fishing Fleet	1,063.9
Butterfish Industry	1,248.8
Simulated Seafood Industry	0
Shipbuilding Industry a/	1,759.6
Other Shipbuilding b/	939.9
Total	5,012.2

a/ These data exclude shipbuilding operations on Snake Bayou and above the Highway 188 Bridge.

b/ These data are for Snake Bayou and the operations above the Highway 188 Bridge. Also shown included are operational cost inefficiencies for an additional shipbuilder who is located just below the Highway 188 Bridge, but was not include in those shipbuilders located along the existing Federal Project Channel.

WITH-PROJECT CONDITIONS

Table 22 summarizes the average annual equivalent operational cost inefficiencies, costs inefficiencies remaining under with-project conditions and the eliminated cost inefficiencies (benefits) by industry for each channel depth considered under various with-project condition scenarios. In summary, a 16-foot channel eliminates almost all the future without-project operational cost inefficiencies to the commercial shrimping fleet; and an 18-foot channel would eliminate all the operational cost inefficiencies to the other two industries at Bayou La Batre. The derivation of benefits for each channel depth by industry is discussed below.

14-foot Channel. Based upon Table 22, [illegible]at of the delays, damages and other additional operational costs of the commercial fleet would be eliminated with a 14-foot channel. Since 71 percent of the gulf trawlers in this fleet draft 12 feet when fully loaded and cannot exit or enter this channel when high tides are not available, particularly during winter months when low tides combine with northerly winds, the benefits to a 14-foot channel become evident.

Two (2) feet of underkeel clearance was added to the loaded draft of the shrimp trawlers (as shown in Table 8B) to determine the channel depth which would eliminate the cost inefficiencies. This procedure was also used for the other industry vessels.

The shipbuilding industry at the Bayou would have almost 100 percent of their launch, seatrial and delivery delays and damages removed with a 14-foot channel for most of the trawlers constructed or repaired in the Bayou under the existing condition. Most of the non-trawler vessels (military, etc.) would not benefit from a 14-foot channel.

16-foot Channel. The draft requirements of the commercial shrimping fleet would be almost fully met at 16 feet (99 percent). However, damages and delays of the larger local stern trawlers (semi-processors) used in the commercial fleet would still remain at 16 feet.

There are no benefits to the butterfish industry at this channel depth since these freezer processors which would start operations out of Bayou La Batre in the first year of project life (1991) will have loaded drafts of 15-feet and must have 2-feet underkeel clearance.

In addition to the benefits shown for a 14-foot channel for shipbuilding, some of the smaller split operations and offshore operations could be accomplished in the Bayou with a 16-foot channel and thus, become benefits to a 16-foot channel.

18-Foot Channel. All additional operational costs for the commercial shrimping fleet would be eliminated at this depth. Even if the Bayou's gulf fleet should be replaced with all stern trawlers (semi-processors), an 18-foot channel would accommodate these vessels.

The stern trawlers (freezer-processors) used in the butterfish industry at the Bayou under Future Without-Project Conditions could deliver their catch dockside at the Bayou instead of landing their catch at Pascagoula, MS. All these extra trucking and handling costs identified under the without-project would be eliminated with an 18-foot channel.

All delays and damages related to new construction in the shipbuilding industry would also be eliminated at 18 feet. This includes the major split operations for military vessels which will occur under the Future Without-Project Condition. But, the repair of small tankers and research vessels off Petit Bois Island will continue to occur with this channel depth in the Bayou.

20-foot Channel. The only additional direct benefits to a 20-foot channel over an 18-foot channel accrue from the small tankers and research vessels which are repaired off Petit Bois Island by one of the shipyards in Reach 3. These small tankers and research vessels could be repaired dockside in Bayou La Batre with a 20-foot depth. This would eliminate the additional expenses associated with the repairs now made at Petit Bois Island.

TABLE 22
WITH-PROJECT
Average Annual Equivalent Costs Remaining and Benefits
By Channel Depths at Bayou La Batre
October, 1986 Prices
($1,000)

	Without-Project AAE Costs	WITH-PROJECT							
		AAE Costs Remaining				AAE Benefits			
		14'	16'	18'	20'	14'	16'	18'	20'
Commercial Fishing Fleet a/	1,063.9	162.3	9.6	0	0	901.6	1,054.3	1,063.9	1,063.9
Butterfish Industry	1,248.8	1,248.8	1,248.8	0	0	0	0	1,248.8	1,248.8
Simulated Seafood Industry	0	0	0	0	0	0	0	0	0
Shipbuilding Industry:									
Main Channel a/	1,759.6	1,215.4	1,185.8	12.8	0	544.2	573.8	1,746.8	1,759.6
Snake Bayou	365.1	0 b/	0	0	0	365.1 b/	365.1	365.1	365.1
Above 188 Bridge	574.8	0	0	0	0	574.8	574.8	574.8	574.8
TOTALS	5,012.2	2,626. 5	2,444.2	12.8	0	2,385.7	2,568.0	4,999.4	5,012.2

a/ These data exclude industries located along Snake Bayou above the Highway 199 Bridge.

b/ $140.4 are benefits to a 12-foot channel in Snake Bayou beginning approximately 400' from mouth and for approximately 900 feet.

Note: "AAE" = Average Annual Equivalent

SENSITIVITY ANALYSIS

The operating costs and related project benefits associated with lack of depth, which have been presented in the above paragraphs, are alternative without-project condition scenarios. Four (4) alternative scenarios are discussed below.

No Growth in All Four Industries. Should each of the four industries discussed herein remain at 1986 levels and only experience existing condition additional operational costs during the Future Without-Project period, benefits to a 14-, 16-, 18- and 20-foot channel would be less than those computed for the most-likely without-project condition scenario. These reduced benefits are shown in Table 23.

Non-Development of Butterfish Industry. Should this industry not be developed during the Future Without-Project period and other industries remain at 1986 levels, the benefits to the 14- and 16-foot channels would be the same as those shown in Table 23. The benefits to the 18- and 20-foot channels would be $3,115,400 and $3,126,200, respectively as shown in Table 23. However, there is ample evidence that the butterfish industry will fully develop since large research and capital outlays for conversion of 10 Gulf of Mexico trawlers have already occurred.

Discontinuance of Split-Operations by Shipbuilders. Should none of the 17 shipbuilders attempt any split operations in order to construct larger vessels under the without-project period of analysis, the benefits to the 14-20-foot channels would be $2,385,700, $2,568,000, $3,825,600 and $3,825,600, respectively (see Table 24). The capital, technology and labor infrastructure of the shipbuilding industry at the Bayou will, however, continue to attract customers who demand quality-constructed larger vessels at the cheapest price available.

Other Considerations. There are three (3) factors which can directly affect the commercial shrimping fleet and concomitantly the shipbuilding industry at Bayou La Batre. These factors are listed and discussed below.

a. The impending required use of a turtle excluder device (TED) by shrimp vessels which could/could not affect the future level of shrimp catch in the Gulf of Mexico;

b. The potential 30 percent marsh loss with a resulting 30 percent decrease in shrimp yield in the Gulf of Mexico as indicated in Louisiana Coastal Area, Louisiana Land Loss and Marsh Creation, Initial Evaluation Study, New Orleans District, USACE, November, 1984; and,

c. The possible passage of state legislation in Louisiana which would tax the trucking of shrimp landed in Louisiana to other states for processing.

Turtle Excluder Device. Based upon information from NMFS, Pascagoula, MS, there are numerous beneficial reasons for the GOM Fisheries Management Council to require GOM shrimp trawlers to use the TED. 43/ There will be 97 percent protection for several species of sea turtles in the GOM which are on the endangered or threatened species list, particularly the Kemp's Ridley sea turtle (Lepidochelys kempii), while also preserving the shrimp catch.

TABLE 23
No Growth Scenario - All Industries on Federal Channel at Bayou La Batre, Alabama
October 1986 Prices ($1000)

	Existing Costs (12')	Costs Remaining				Benefits			
		14'	16'	18'	20'	14'	16'	18'	20'
Commercial Fishing Fleet	838.0	136.6	8.7	0	0	701.4	829.3	838.0	838.0
Butterfish Industry	N/A	0	0	0	0	0	0	0	0
Simulated Seafood Industry	0	0	0	0	0	0	0	0	0
Shipbuilding Industry:									
Main Channel	1,489.8	1,029.0	1,004.0	10.8	0	460.8	485.8	1,479.0	1,489.8
Snake Bayou	310.2	0	0	0	0	310.2	310.2	310.2	310.2
Above Hyw 188	488.2	0	0	0	0	488.2	488.2	488.2	488.2
Totals	3,126.2	1,165.5	1,012.7	10.8	0	1,960.6	2,113.5	3,115.4	3,126.2

a/ Cost inefficiencies to shipbuilders on Snake Bayou and above Highway 188 are not included in this table.

Table 24
Non-Development of Split Operations
October, 1986 Prices ($1,000)
(All Channels)

	Without-Project Costs	Costs Remaining				Benefits			
		14'	16'	18'	20'	14'	16'	18'	20'
Commercial Fishing Fleet	1,063.9	162.3	9.6	0	0	901.6	1,054.3	1,063.9	1,063.9
Butterfish Industry	1,248.0	1,248.0	1,248.0	0	0	0	0	1,248.0	1,248.0
Simulated Seafood Industry	0	0	0	0	0	0	0	0	0
Shipbuilding Industry:									
Main Channel	573.8	29.6	0	0	0	544.2	573.8	573.8	573.8
Snake Bayou	365.1	0	0	0	0	365.1	365.1	365.1	365.1
Above 188 Bridge	574.8	0	0	0	0	574.8	574.8	574.8	574.8
Total	3,825.6	1,439.9	1,257.6	0	0	2,385.7	2,568.0	3,825.6	3,825.6

Further, the finfish bycatch (100 percent kill) in the shrimp nets will be reduced. Historically, the shrimp nets catch 10 to 12 times the weight of the shrimp catch in sports and ground fish much of which are discarded or wasted in the GOM. The TED'S are expected to prevent over 50 percent of this waste.44/

The TED's will be required March 1, 1988 by shrimpers in the area of the GOM from the barrier islands to 15 miles in the open Gulf where the large female turtles are most vulnerable; and will also be required inside the islands (inshore) if the shrimper trawls for more than 90 minutes continuously. The NMFS device is a collapsible, two-pipe device installed in the nets which allows large objects to escape unharmed but retains the shrimp catch. The NMFS at Pascagoula feels that this device (costing $350-$400 to construct and install in the nets) will have a positive effect on the total GOM shrimp catch and costs thereof will be immediately recoverable for the following reasons: 45/

a. Less time will be spent by the shrimper sorting the shrimp catch because less bycatch will be in the nets;

b. the quality of the shrimp catch will increase since the heavy bycatch will not crush/break the shrimp;

c. fuel consumption will decrease because of lesser weight in the nets;

d. the life of the nets will increase since the bycatch will be more than 50 percent reduced during long drags; and

e. the needless finfish kill by shrimpers will be more than 50 percent reduced, which is encouraged by sports and ground fisherman. (Based upon this rationale, 1.8 billion pounds of finfish were wasted shrimpers in 1986, or 304,000 pounds of shrimp x 10 x .60% would have been saved.) These officials believe that the decline in the croaker biomass in the GOM in the last 15-20 years is directly related to the shrimping intensity in the GOM.46/

Marsh Loss. There is a hypothesis that a 30 percent marsh acre reduction west of Mississippi River to the Texas Border would result in a 30 percent decrease in all GOM fisheries yield. MDO researchers believe that the trend in shrimp yields for this exact area along the Louisiana Coast (Mississippi River to Texas border) does not support such a hypothesis. Based upon data for this area from 1980 to 1986, 47/ shrimp landings have increased dramatically (103.1 to 165.7 million pounds). MDO researchers feel that existing data supports a stable biomass of shrimp in the Gulf of Mexico, which is also the position of the GOM Fisheries Management Council.

Pending Legislation. Only 34 percent of the shrimp processed at the Bayou is landed at the Bayou; the remainder is trucked in from mainly Louisiana. The State of Louisiana was contemplating passing legislature in early 1987 which would heavily tax, at the point of sale, the shrimp which are then trucked out of the state. Based upon information furnished by Mr. Ted Flowers, NMFS Representative at Bayou La Batre, this proposed action by Louisiana would not affect the landings nor processing level at the Bayou since the major seafood processors at the Bayou have purchased seafood houses in Louisiana during 1987 which circumvents a "sale" in Louisiana. In other words, there is no concern that the level of the seafood processing industry at the Bayou will decrease in the future. Should Louisiana become even more aggressive in taxing and/or stopping their landings from being trucked to the Bayou, it is expected that the average size of the Bayou La Batre vessel will increase even more. Such actions would cause the stern trawler ("freezer processor") to emerge at Bayou La Batre more quickly in the shrimping industry.

Summary of Sensitivity Analysis.

In summary the costs stated herein under the Future Without-Project Condition for the commercial shrimping fleet have been accurately portrayed for the following reasons:

a. a stable shrimp biomass exists in the GOM;
b. a 50 percent underutilization of seafood processing capital investment exists;
c. a fleet of larger-sized vessels will exist in the future; and
d. an increased level of shrimping technology will continue which is unsurpassed in the Gulf of Mexico.

The costs associated with the butterfish industry are an extension of the trend of the commercial fishing fleet. Large freezer processors like the ones from the Atlantic will quickly emerge in the Bayou. Split operations in the construction of larger vessels by shipbuilders will occur under future without-project condition.

The simulated seafood industry is in the developmental stage in the US. A new use for "trash fish" caught in most commercial fishermen's nets could awaken this new industry in the U.S. Based upon coordinated research by the U.S. Government (NMFS, FDA, etc.), this product can gain the same acceptance in the U.S. as it has in Asian countries (Japan, particularly). No cost inefficiencies have been shown under Future Without-Project Condition for this industry. Although there is no certain indications at present, MDO researcher's feel that this industry could at some time develop on the Gulf Coast using Gulf of Mexico species as raw material. If this happens, inefficiencies in the Bayou have been understated.

It could be contended that the Bayou La Batre shipbuilding industry is a direct mirror of the existing fleet at the Bayou. However, 35 percent of the 1986 construction level of new vessels was for foreign buyers and use. More than 50 percent of the vessel construction schedules at the Bayou have been for foreign operators in 1987.48/ This ratio is expected to reach 90 percent in the future based upon fastly emerging fishing technologies in the Central and South Americas, India, Indonesia, Africa, etc., all of which are demanding higher and faster construction levels of the Bayou La Batre shipbuilders which build these vessels at costs of about 30 percent less than their closest U.S. competitors. As has been stated, this is due to excellent technology levels, low overhead, non-union, cross-skilled labor forces. Their high-quality, low cost deliveries have built a reputation in numerous countries which precludes U.S. competitors from even bidding on fleets of vessels demanded by these foreign customers. Therefore, the projections of the growth of losses presented under the Future Without-Project Condition for foreign shipbuilding businesses are likely understated. The Bayou La Batre shipbuilders feel that the only reason construction of larger vessels for foreign customers is not now accomplished by Bayou La Batre shipbuilders is lack of channel depth.

As for future U.S. Government vessel construction at Bayou La Batre, the MDO field researchers found repeated denial on their bids for U.S. Coast Guard and Navy vessels to be solely lack of channel depth on the Bayou La Batre channel. It is likely that these shipbuilders will continue to annually attempt split operations in order to construct vessels for this market.

In summary, the Future Without-Project Condition losses enumerated herein associated with all the industries located along this channel are a most-likely (yet conservative with respect to project justification) representation of future without-project operations. Under differing future conditions, as described above, the deepening of the Bayou could result in much more substantial operating cost savings, as well as local economic growth.

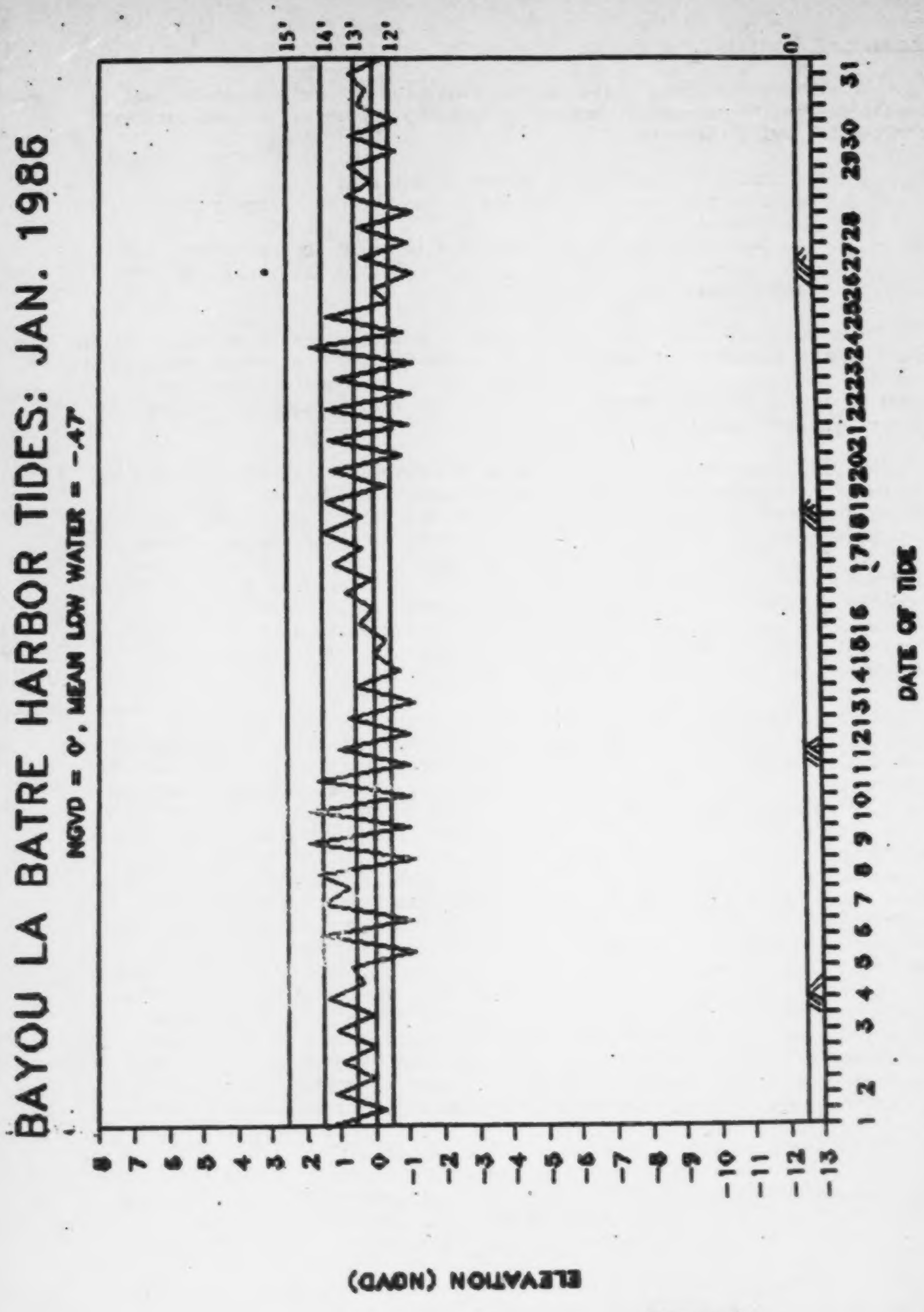

Figure 4
Tide Elevations, Jan. 1986

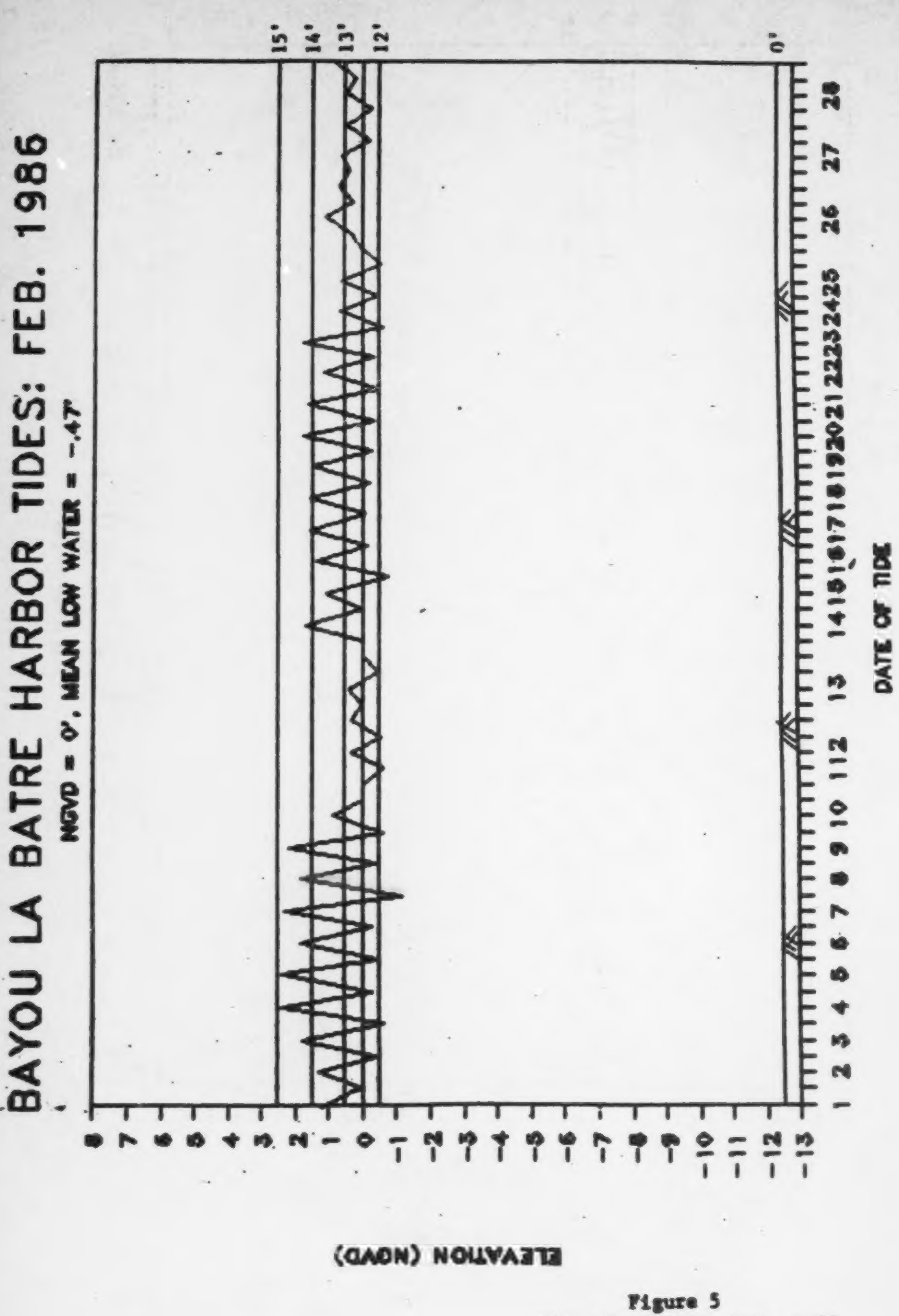

Figure 5
Tide Elevations, Feb. 1986

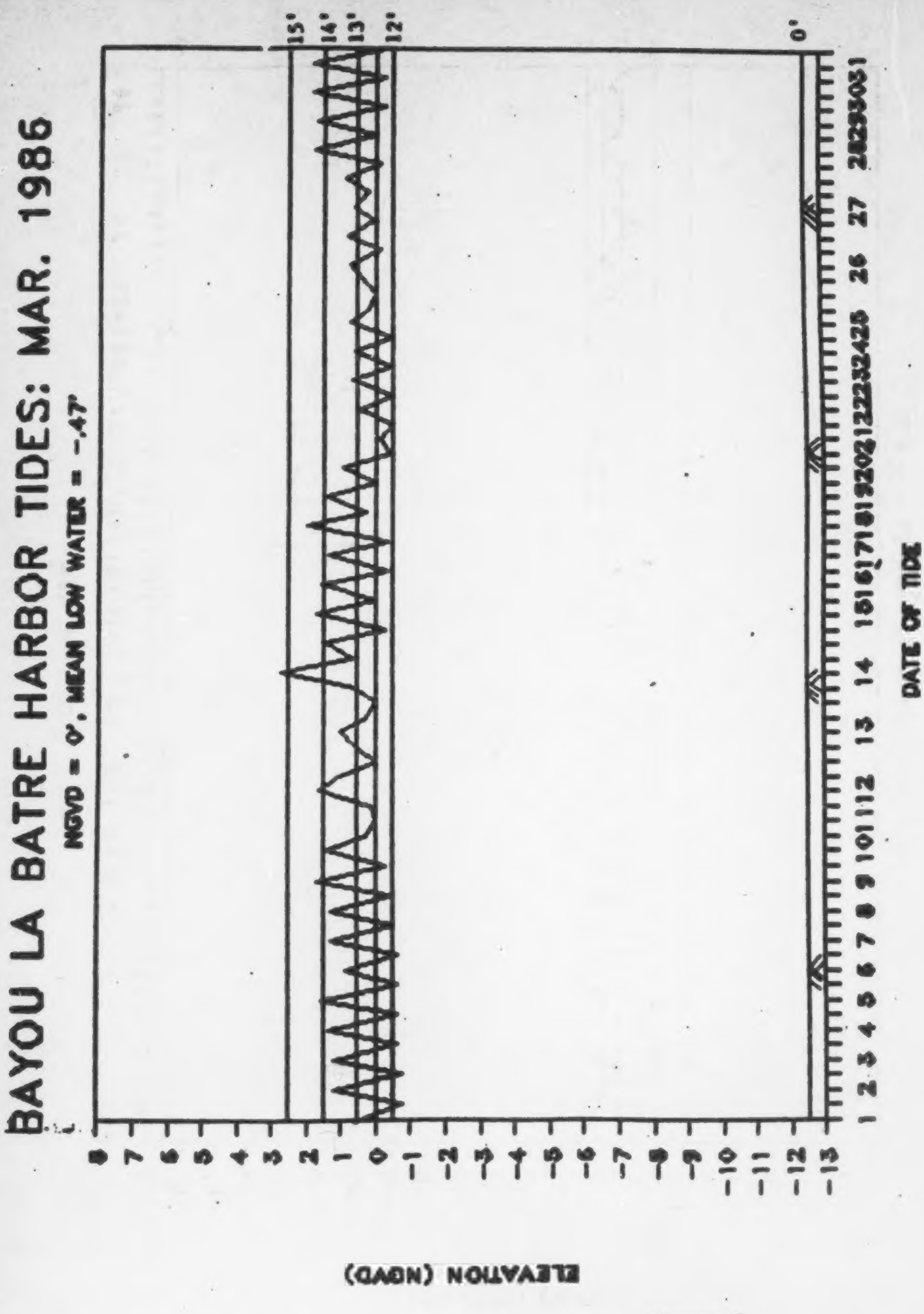

Figure 6
Tide Elevations, Mar. 1986

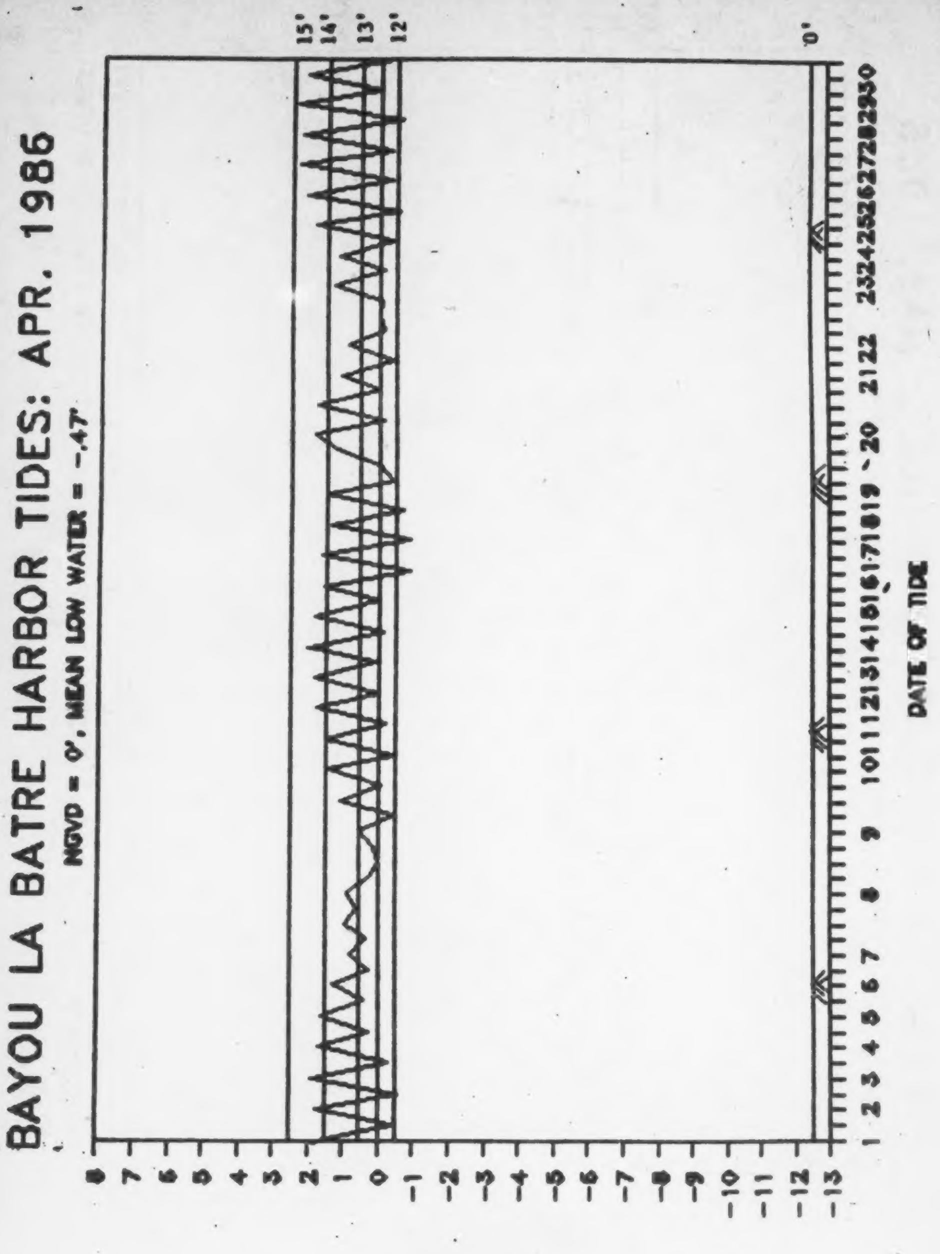

Figure 7
Tide Elevations, Apr. 1986

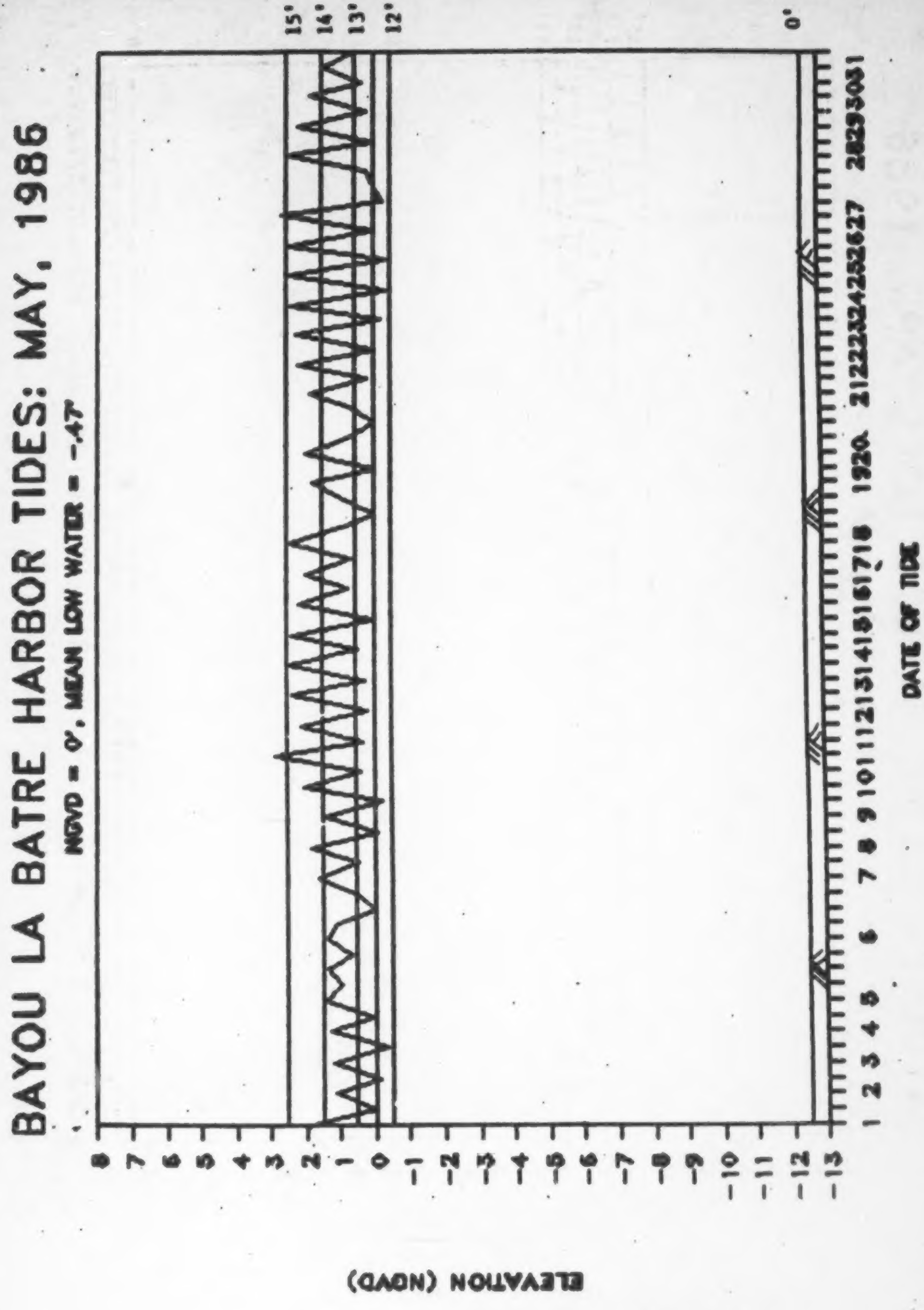

Figure 8
Tide Elevations, May 1986

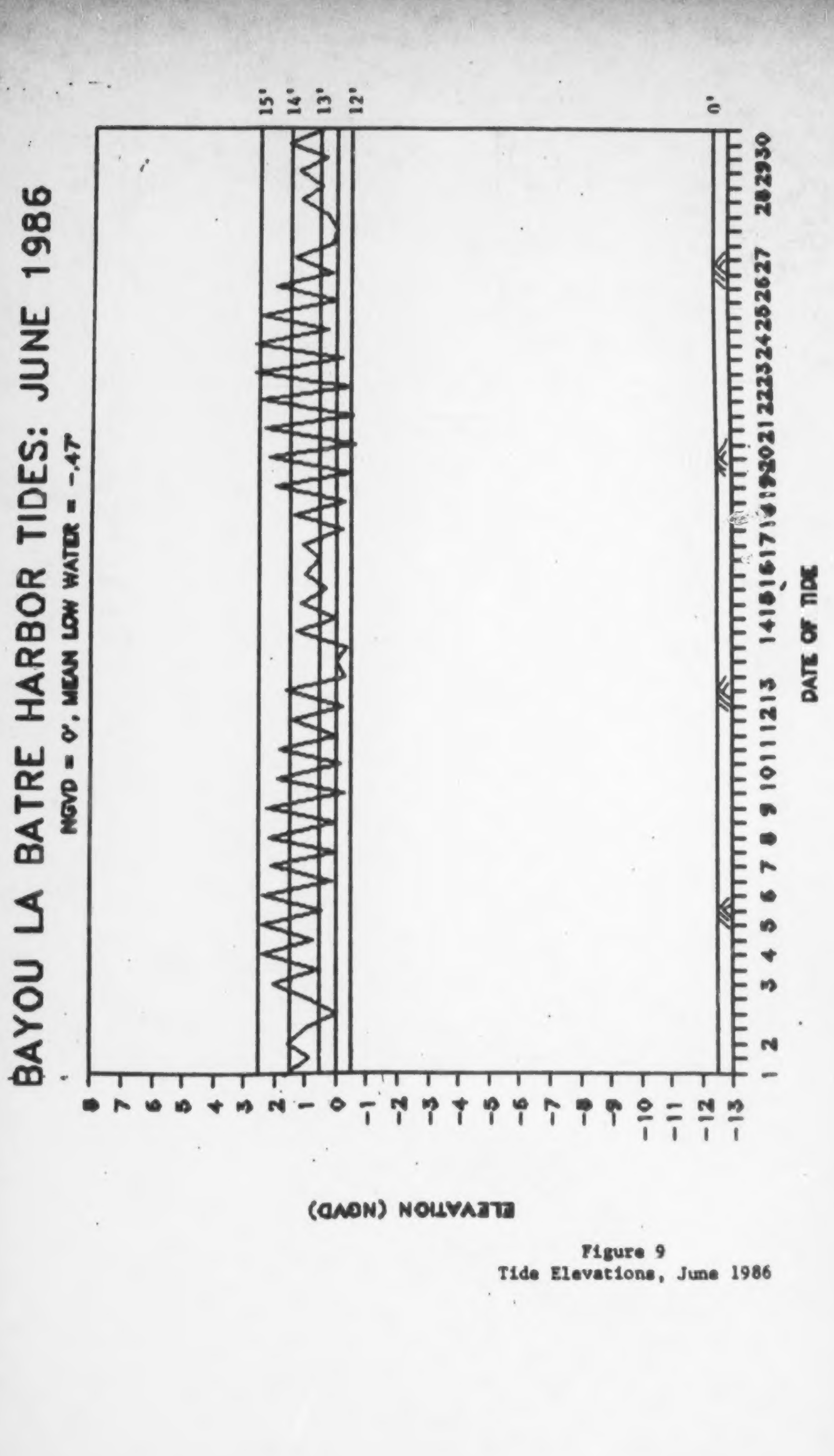

Figure 9
Tide Elevations, June 1986

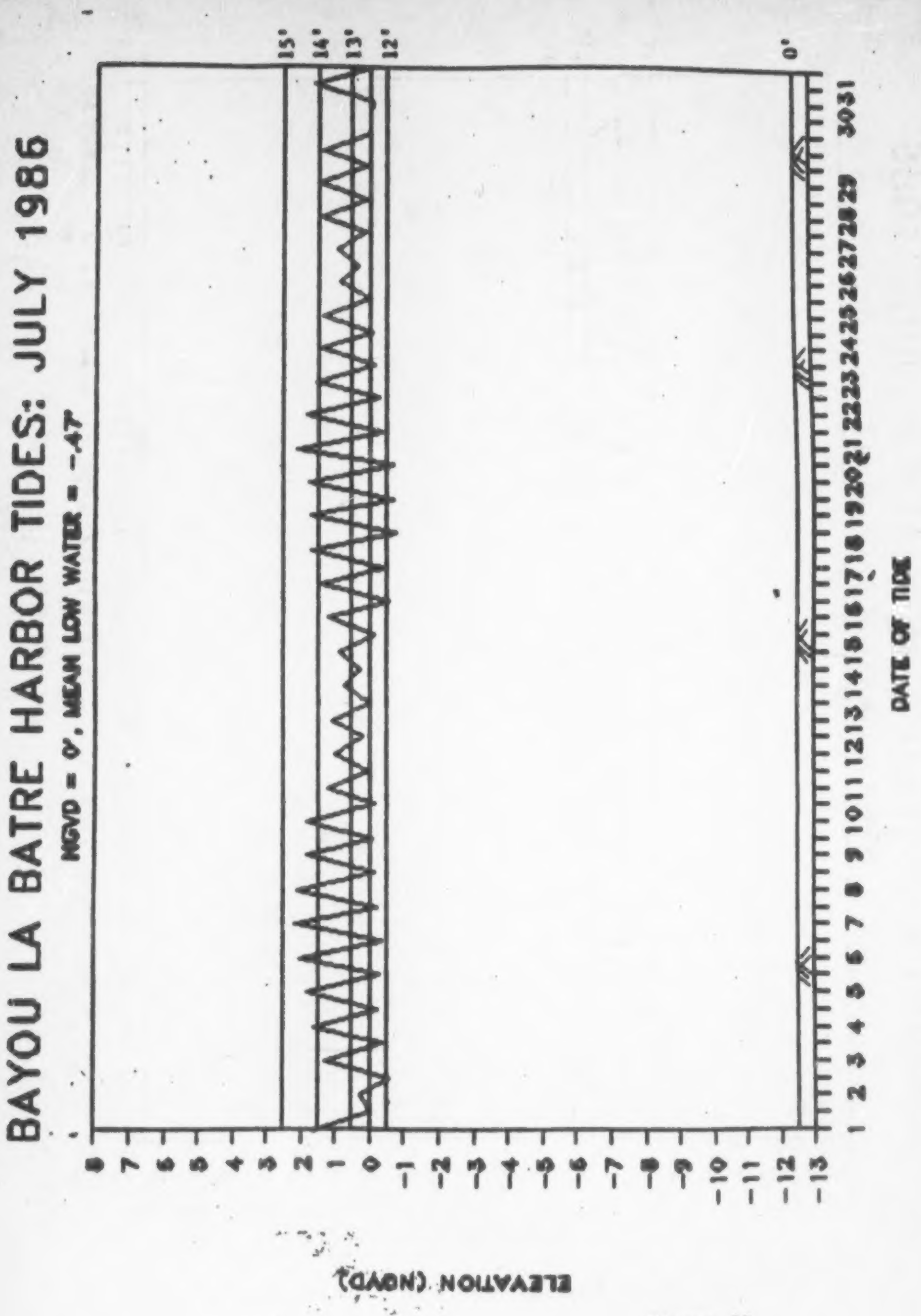

Figure 10
Tide Elevations, July 1986

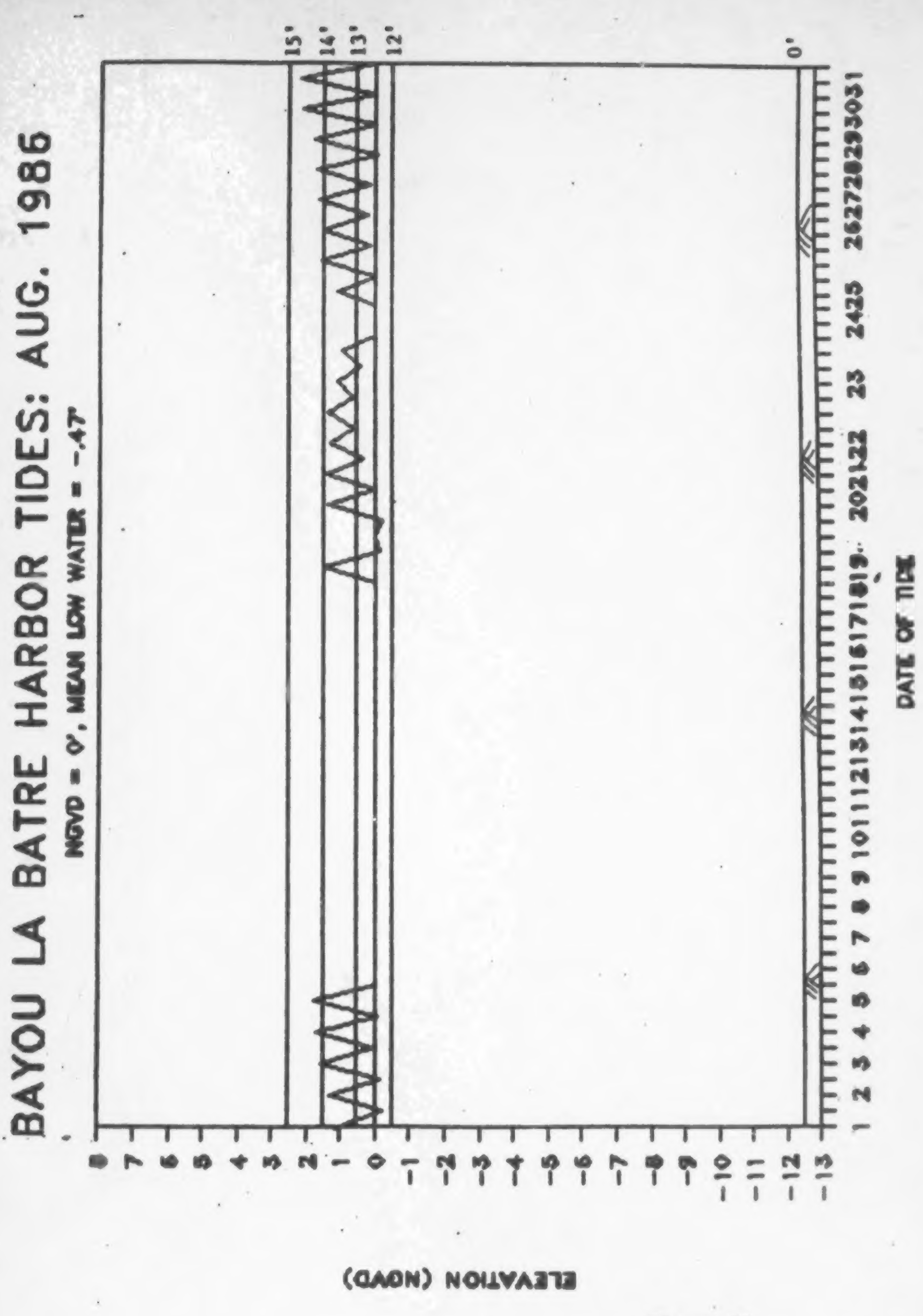

Figure 11
Tide Elevations, Aug. 1986

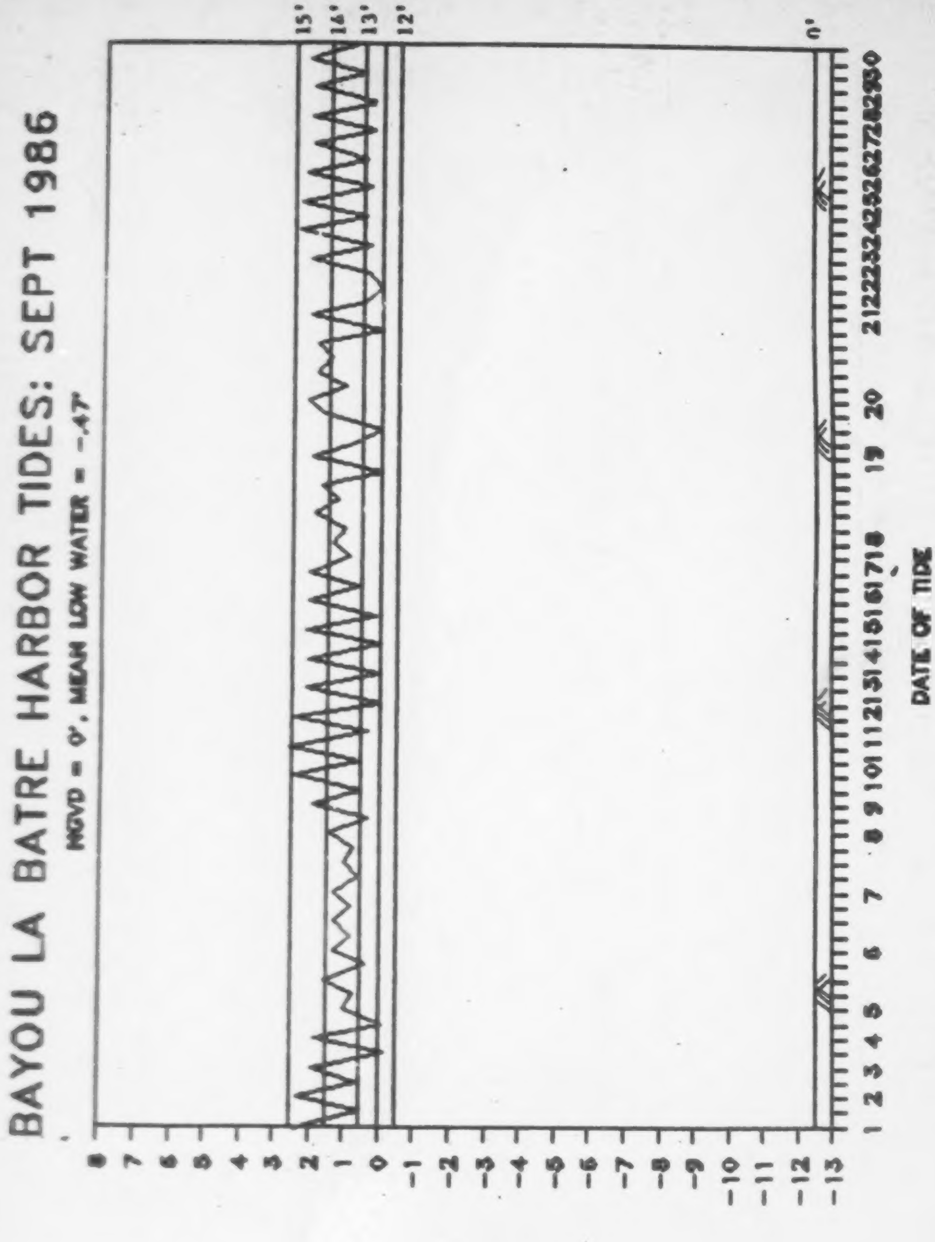

Figure 12
Tide Elevations, Sept. 1986

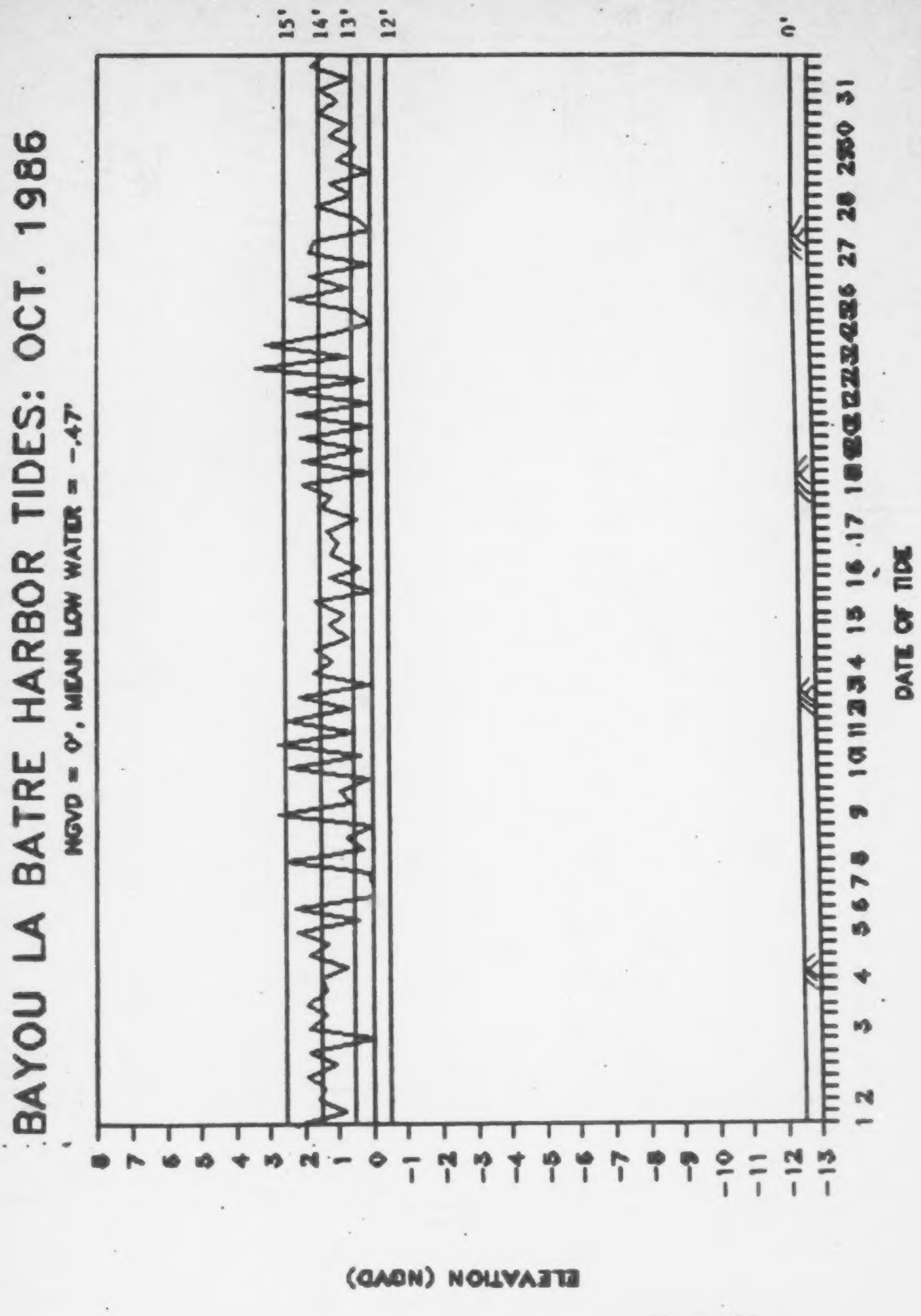

Figure 13
Tide Elevations, Oct. 1986

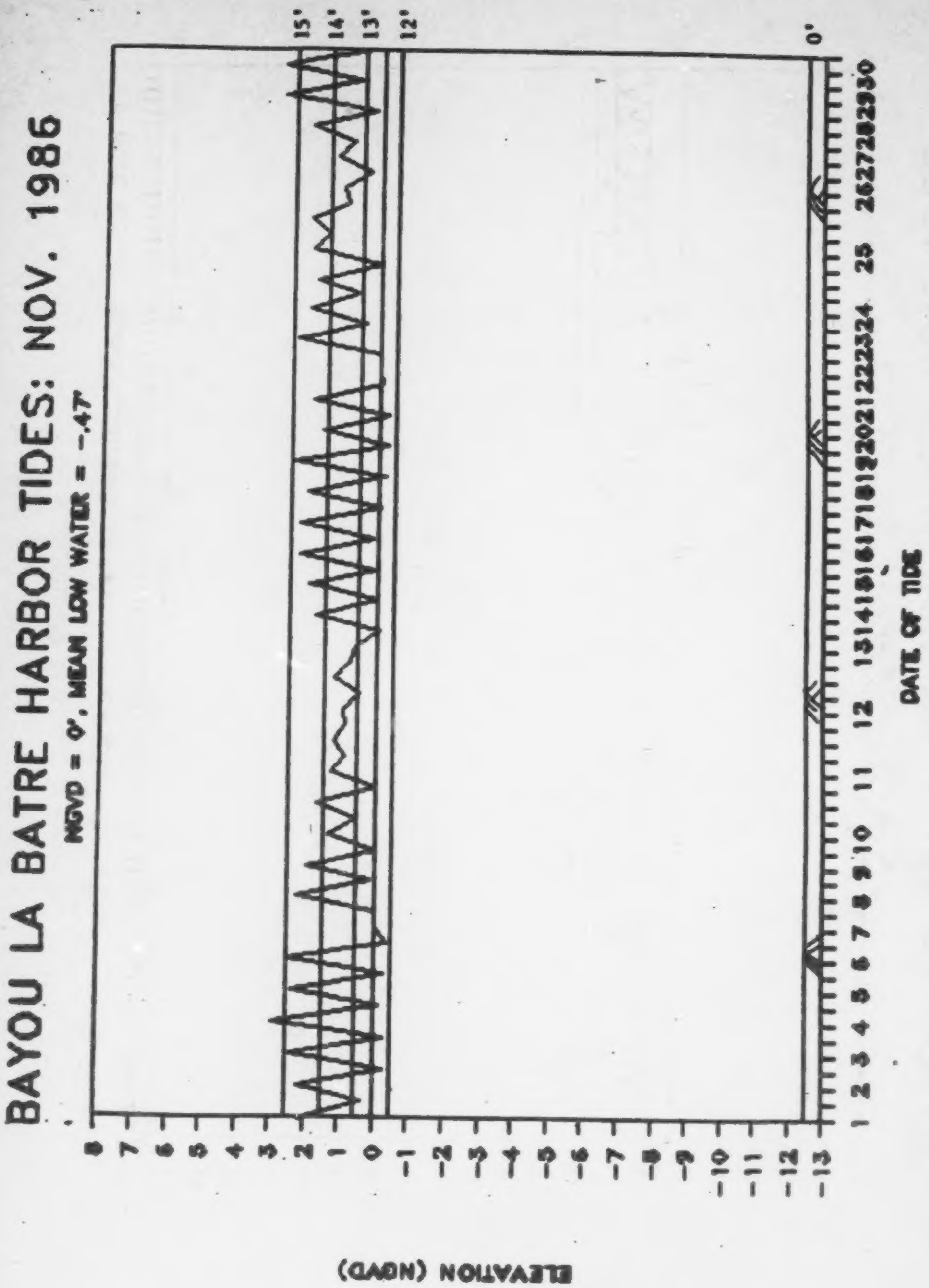

Figure 14
Tide Elevations, Nov. 1986

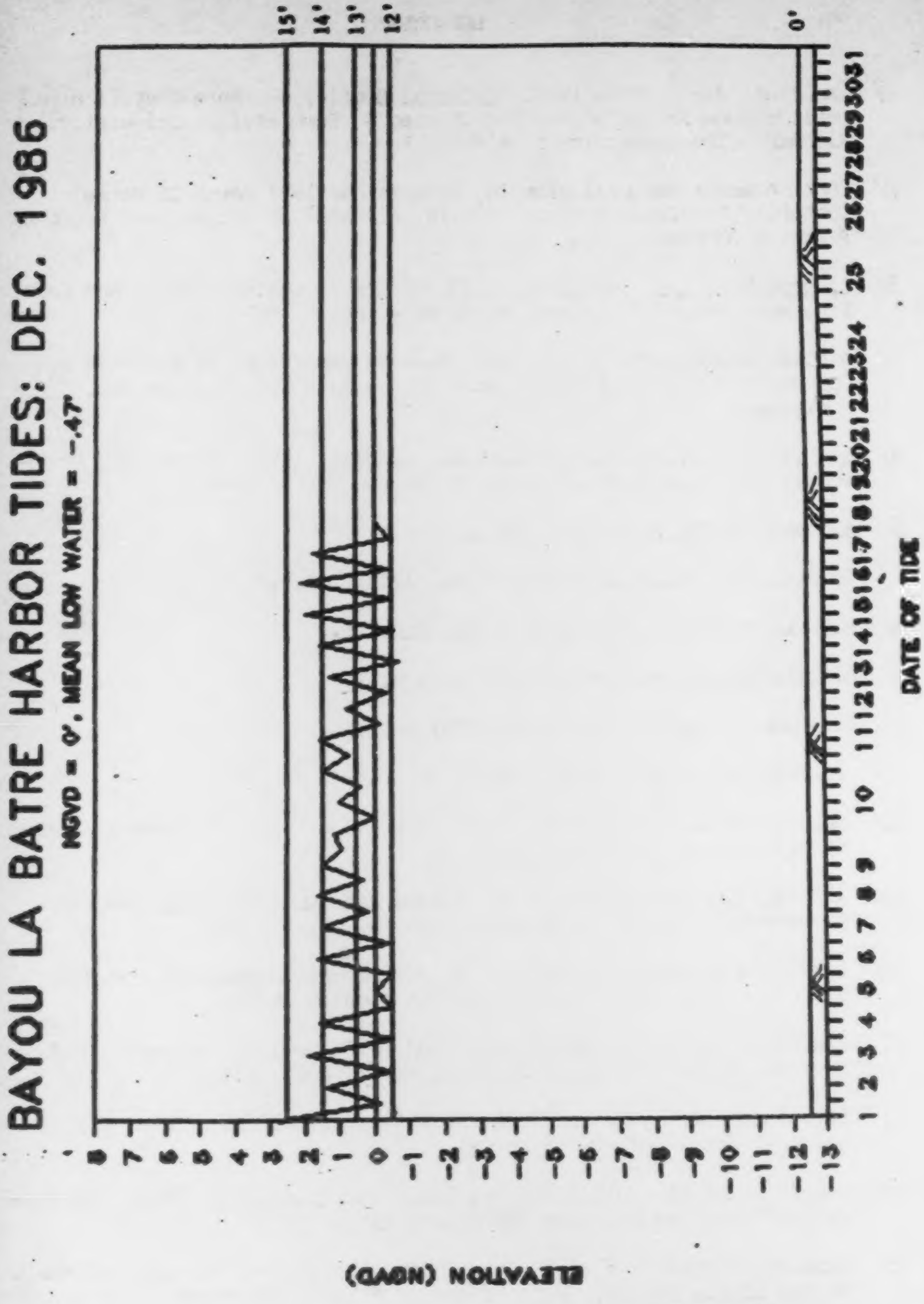

Figure 15

Tide Elevations, Dec. 1986

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1/ Hamilton. J.P., 1910, 1976. Colonial Mobile, Southern Historical Publications No. 20 edited for Charles G. Summersell. University, Alabama: The University of Alabama Press.

2/ South Alabama Regional Planning Commission, 1977 Bayou La Batre Community Development Plan. Mobile, Alabama: South Alabama Regional Planning Commission.

3/ Alabama Municipal Data Book, 1985, Office of State Planning and Federal Programs, State of Alabama, Montgomery, AL.

4/ Alabama County Data Book, 1985. Alabama Department of Economic & Community Affairs, Office of State Planning & Federal Programs, Montgomery, AL.

5/ General Population Characteristics, Alabama, 1980, Census of Population, U.S. Dept of Commerce, Bureau of the Census.

6/ Alabama County Data Book, 1985,, loc. cit.

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16/ Data furnished by National Marine Fisheries Services (NMFS) office at Bayou La Batre (Mr. Ted Flowers).

17/ Fisheries of the United Sta Sea Fosh catch sinceotes, 1986. National Marine Fisheries Services (NMFS), op.cit.

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19/ Fisheries of the U.S., 1986, op. cit.

20/ Fisheries Management Plan, op. cit. pp. 4-27 through 4-42.

21/ Letter from NMFS, Galvaston Laboratory, Dr. E. F. Klima, dated July 29, 1987, with computer listings of all Bayou La Batre landings for 1985 and 1986.

22/ Commercial Fishing Cost Return Projects for Gulf Coast Area, Centaur Associates, Inc., Washington, DC, Corps Contract DACW01-84-C-0111, Undated.

23/ Ibid., p. 2-16 and extrapolated to a 12-foot vessel.

24/ Russ Fee, "Researchers have high hopes for Gulf butterfish," National Fisherman, September, 1986, p.8.

25/ "Gulf butterfish could spread from reject to catch of gold" The Fish Boat, March 1986, pp. 24-25.

26/ Ibid.

27/ "Commercial Vessel Activities," Tech. Memo on 1986 Initial Commercial Butterfish Venture in the Northern Gulf of Mexico, NMFS, Pascagoula, MS (Unpublished).

28/ "The Market Place," The Fish Boat, June, 1986, p.7.

29/ "Building for other lands," The Fish Boat, December, 1986, pp. 24-25.

31/ loc. cit., pp.77

32/ loc. cit., pp. 81-86.

33/ loc. cit., (supplemental)

34/ Based upon data from NMFS representative, Mr. Ted Flowers, at Bayou La Batre, September,1987.

35/ Based on data from Mr. Brian Perkins, Seafood Technologist, Alabama Sea Grant Advisory Service, Mobile, Alabama, July, 1987.

36/ Fisheries of the U. S., 1980-1986, op. cit.

37/ Based upon data from Mr. Ted Flowers, NMFS, Bayou La Batre, Alabama, August, 1987.

38/ Ibid.

ENDNOTES (Con't)

39/ "Atlantic Challenge - Ireland's biggest yet" and "Container trawlers for France," World Fishing, June 1986, pp. 30-32

40/ Conversations with research personnel, National Marine Fisheries Service Office, Pascagoula, MS., 1987

41/ "Building for other lands," The Fish Boat, December, 1986, pp. 24-25, and "Roaton Island keeps expanding its Steiner-built Armada," The Fish Boat, Sept, 1986, pp. 20-21, 32

42/ Ibid.

43/ Data furnished by Mr. Will Seidel, NMFS Laboratory, Pascagoula, Mississippi, September 21, 1987.

44/ Ibid.

45/ Ibid.

46/ Ibid.

47/ Data furnished by Ms. Margo Hightower, NMFS National Fisheries Statistical Offices, Galveston, Texas.

48/ Based upon marine engine sales representatives' data (Mr. Charles Castro, Caterpillar sales representative, and Mr. Larry Neff, Cummins sales representative, both of Mobile, Alabama).

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ENVIRONMENTAL IMPACT STATEMENT

FINAL
ENVIRONMENTAL IMPACT STATEMENT
BAYOU LA BATRE
NAVIGATION IMPROVEMENTS

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FINAL
ENVIRONMENTAL IMPACT STATEMENT
BAYOU LA BATRE
NAVIGATION IMPROVEMENTS

The responsible lead agency is the U. S. Army Engineer District Mobile.

Abstract. The Mobile District has investigated public concerns of the Bayou La Batre study area related to providing increased width and depth in the Bayou La Batre navigation channel. Of the plans initially formulated, 18 were selected for detailed study along with the "No Action" alternative. All plans considered for detailed study included provision of a 14- by 75-foot channel from the turning basin to the Highway 188 bridge, a channel 12- by 75-foot for a distance of 1500 feet above the bridge, a channel in Snake Bayou 14- by 50-foot from the junction with Bayou La Batre for 500 feet then 12- by 50-foot for a distance of 800 feet, a 18- by 100-foot channel south from the turning basin to the mouth of the bayou, a 18- by 120-foot channel from the mouth of the bayou into Mississippi Sound to the Gulf Intracoastal Waterway (GIWW). Two alignments from this point to deep water in the Gulf were considered. One southward through Petit Bois Pass, with dimensions of 18 by 120 feet in the Sound and 19 by 150 feet through the Pass into the Gulf, and one westward along the GIWW alignment, with a dimension of 18 by 120 feet, to it's intersection with the Pascagoula Ship Channel. Disposal options which are considered include: upland disposal, including a new and the existing disposal area, for new work and maintenance material dredged from Bayou La Batre and Snake Bayou; wetland establishment, open water disposal or berm construction in Mississippi Sound in depths greater than 12 feet and Gulf disposal of new work from the Mississippi Sound portion; open water disposal in water greater than 12 feet in depth of maintenance material from the sound portion; littoral and Gulf disposal for new work and maintenance material from the Petit Bois Pass alignment; open water, littoral, or Gulf disposal for new work from the GIWW alignment; and open water disposal for maintenance material from this alignment. Based on economic and environmental considerations, Plan XI has been recommended as the National Economic Development (NED) plan. This plan includes deepening and widening the channels including the GIWW alignment as described above and the following disposal alternatives: establishment and use of a new 107 acre upland disposal area and use of the existing 70 acre disposal area for new work and maintenance materials dredged from the Bayou portion of the project; establishment of an emergent berm along the northeastern shore of Isle aux Herbes and direct placement in water with depths greater than 12 feet in Mississippi Sound of new work material from the Mississippi Sound channel and thin layer placement of maintenance material from this channel; and direct placement of new work material and thin layer placement of maintenance material 5000 feet south of the GIWW channel. Impacts to significant resources due to the recommended plan have been minimized through planning and avoidance. Remaining impacts have been determined to be negligible and therefore no additional mitigation is proposed.

If you would like further
information to this
statement, please contact
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(205) 690-2724

NOTE: Information, displays, maps, etc., discussed in the Bayou La Batre Main Report are incorporated by reference in the FEIS.

ENVIRONMENTAL IMPACT STATEMENT

BAYOU LA BATRE, ALABAMA
NAVIGATION CHANNEL IMPROVEMENTS

1.0 Summary.

1.1 **Major Conclusions and Findings.** Alternative Plan XI at the 18-foot depth interval with the Snake Bayou channel segment and channel improvements above the turning basin in Bayou La Batre was designated as the National Economic Development (NED) plan because it provides for economically efficient improved navigational capabilities at Bayou La Batre, Alabama.

Placement of dredged materials in the open water sites within Mississippi Sound has been evaluated following the 404(b)(1) Guidelines, in compliance with the Clean Water Act of 1977, 33 U.S.C. 1251 et.seq. (See Appendix D to the Main Report). State water quality certification under Section 401 of the Clean Water Act will be obtained prior to the disposal of dredged material into waters of the U. S. The recommended plan is consistent to the maximum extent practicable with the Coastal Zone Management Programs of the States of Alabama and Mississippi.

1.2 **Areas of Controversy.** Historically the Federal and state environmental agencies have recommended that open water disposal of dredged material in Mississippi Sound be stopped. Their preference has been: 1) the use of suitable upland disposal areas, or 2) placement in deep water sites in the Gulf of Mexico. All efforts have been made to fully utilize upland disposal areas for the proposed navigation improvements at Bayou La Batre, however this option will not accommodate all the dredged material associated with the proposed improvements. Placement of new work material in the ocean dredged material disposal site at Pascagoula, while economically feasible, is not the preferred alternative because of the additional cost associated with this method and the lack of environmental benefits for this method compared with the proposed open water placement methods. Placement of maintenance material in the ocean disposal site is not economically feasible at this time. Although differences in opinion still exists relative to the degree of long-term impacts associated with the disposal of dredged material in open water, coordination efforts among the Federal and state agencies has resulted in development of an acceptable disposal plan at Bayou La Batre which results in the beneficial use of the dredged material as shoreline protection for emergent wetlands.

1.3 **Unresolved Issues.** The utilization of all 2 million cubic yards of new work material from the Mississippi Sound Channel segment for shoreline protection at Isle aux Herbes as recommended by the U. S. Environmental Protection Agency and the Fish and Wildlife Service is an unresolved issue. Additional studies will be undertaken during Preconstruction Engineering and Design (PED) in an effort to utilize all this material as recommended. The State of Mississippi, Bureau of Marine Resources, has requested that material removed from the Gulf Intracoastal Waterway segment of the project in Mississippi be utilized for creation of a subsurface shoal area north of Petit Bois Island for the purpose of providing a low-profile fishing reef. This alternative will also be investigated during PED.

1.4 **Relationship to Environmental Requirements.** The recommended plan as well as the other alternatives are in compliance with applicable statutes and executive orders, as provided on Table EIS-1, for this stage of planning. Section 150 of the Water Resources Development Act of 1976 requires the that use of dredged material to create wetlands be considered during project planning. Use of Section 150 was considered, however, the berm to be constructed will not be a permanent structure therefore the permanence of the wetlands which would be constructed can not be guaranteed. If modifications are made during the PED reevaluations described in Section 1.3 above, additional consideration will be made relative to the use of Section 150 for creation of wetlands.

1.5 **The draft Environmental Impact Statement (FEIS) was filed with EPA** 22 July 1988 and the Final EIS was filed with EPA 25 November 1988.

TABLE EIS-1

Environmental Statutes and Executive Orders

Federal Statutes

Archeological and Historic Preservation Act, as amended, 16 USC 469, et. seq.
Clean Air Act, as amended, 42 USC 1857h-7, et seq.
Clean Water Act, as amended, (Federal Water Pollution Control Act) 33 USC 1251, et seq.
Coastal Zone Management Act, as amended, 17 USC 1451, et seq.
Endangered Species Act, as amended, 16 USC 1531 et seq.
Estuary Protection Act, 16 USC 1221, et seq.
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.
Fish and Wildlife Coordination Act, as amended, 16 USC 661, et seq.
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.
Marine Protection, Research and Sanctuaries Act, 33 USC 1401, et seq.
National Historic Preservation Act, as amended, 16 USC 470a, et seq.
National Environmental Policy Act, as amended, 42 USC 4321, et seq.
Rivers and Harbors Act, 33 USC 401 et seq.
Watershed Protection and Flood Prevention Act, 16 USC 1001, et seq.
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.
Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (PL 91-646)
The Gulf Islands National Seashore (GIN) System (PL 91-660)
Coastal Barrier Resources Act (PL 97-348)

Executive Orders, Memoranda, etc.

Flood Plain Management (E.O. 11988)
Protection of Wetlands (E.O. 11990)
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)

EXECUTIVE SUMMARY

BAYOU LA BATRE, ALABAMA
FEASIBILITY REPORT
ON
IMPROVEMENT OF THE EXISTING FEDERAL NAVIGATION CHANNEL

INTRODUCTION

The City of Bayou La Batre, with a 1984 population of 2,162, and the bayou after which it is named are located in southern Mobile County, Alabama. The community has a long history and tradition in the commercial fishing and shipbuilding trades. Bayou La Batre has developed into one of the most active ports for these activities within the United States. Bayou La Batre is presently served by an existing Federal channel; however, due to the increasing level of activity and larger sized commercial fishing and other vessels currently utilizing and/or being constructed within the existing project, the need to investigate the feasibility for channel improvements exists.

STUDY OBJECTIVE

The objective of the Bayou La Batre Feasibility Study is to investigate the potential for deepening, widening and extending the existing Federal channel and to identify the plan which maximizes net economic benefits while conforming to all environmental laws and regulations.

LOCATION

Bayou La Batre, Alabama is located off Mississippi Sound on the Gulf of Mexico in the extreme southwestern corner of Mobile County, Alabama, about 35 miles southwest of Mobile, Alabama.

HISTORIC AND ECONOMIC PROFILE

Bayou La Batre was first settled in the year 1713 when a battery was constructed to defend smuggling and pirating activities that were conducted there by Sieur de Bienville, former governor of French Louisiana. When coastal Alabama was opened to British and American settlers; fishing, livestock and, later, resort hotels became important economic pursuits. At the turn of the 20th century, however, fishing and seafood canning were predominant. Shipbuilding emerged at Bayou La Batre during World War I and has gained in importance since that time.

A total of 57 seafood processors - 10 major establishments - operate in Bayou La Batre and employ between 900 and 1200 persons annually. An average of over $100 million in seafood is processed each year, much of which is shrimp that is landed and/or trucked into Bayou La Batre for processing. In addition, local interests, with assistance from the National Marine Fisheries Service, have been test fishing for butterfish, which are abundant in the Gulf of Mexico and is a delicacy in Japan. Butterfish shows promise as a profitable export item.

Presently, about 150 new vessels, with a sales value of about $90 million are built yearly by the 17 shipbuilders at Bayou La Batre and $4 million in repairs are made to about 1,000 vessels annually. About 35% of new vessel construction and 40% of repairs and conversions are performed for foreign interests each year. This amounts to over $30 million per year that this activity contributes to the United States' balance of foreign trade.

ENVIRONMENTAL SETTING

Bayou La Batre is a tidal stream about 10 miles long. The major biotic communities within the project area are estuarine open waters, salt marshes, estuarine tidal flats, aquatic beds, forested wetlands and upland forests. Open sound, muddy-sand, and benthic communities occupy about 70 percent of the study area. The coastal marshes, swamps, islands, and beaches of the area support large populations of passerine birds, waterfowl, wading birds, and shore birds. Several active nesting colonies of wading birds are located in the study area. The gopher tortoise, a threatened species, and four species of threatened or endangered sea turtles may occur in the study area. However, no adverse impacts on endangered or threatened species are expected to occur with project implementation.

Water quality within the bayou is generally poor due to sewage discharges and runoff from shipbuilding yards and activities of the fishing fleet. Offshore areas in Mississippi Sound are generally classified for recreation, fish, wildlife, and shellfish harvesting. The Mississippi Sound is separated from the Gulf of Mexico by barrier islands which are not stable and are occasionally broken and severely eroded by hurricane storms. Existing passes through the barrier islands tend to be unstable with shifting shoal areas. Marsh areas which are also subject to erosion are found along the landward side of the barrier islands and adjacent to some of the islands within Mississippi Sound.

EXISTING PROJECT

The existing Federal navigation project serving Bayou La Batre was constructed in 1967 and consists of a 12-foot by 100-foot channel starting at the 12-foot depth contour within

Mississippi Sound and extends to a turning basin located within Bayou La Batre. From the turning basin, a 12-foot by 75-foot channel extends about 3,000 feet upstream and terminates at the Highway 188 bridge crossing. The total length of the existing channel is about 6.3 miles. Maintenance dredging is conducted on a three-year cycle. Of the material dredged during each cycle, about 100,000 cubic yards are placed in an upland disposal site and about 300,000 cubic yards are placed in approved open water sites within Mississippi Sound, west of the channel.

Extensive development and infrastructure to support the commercial fishing and shipbuilding activities exist in close proximity to the bayou. Numerous bulkheads and piers line the channel. From about midway between the mouth of the bayou and the turning basin, the bayou is almost solidly bulkheaded on both sides. The extensive bulkheading extends upstream beyond the limits of the Federal channel on Bayou La Batre and into Snake Bayou, a major tributary. In many locations, buildings housing seafood processing and marine supply facilities are located only a few feet landward of the bulkheads.

PROBLEMS AND NEEDS

The problems with the existing 12-foot deep channel are depth-related operational and production inefficiencies for the commercial fishing fleet, shipbuilding industry, and other marine related industries. The shipbuilding industry is experiencing a demand for construction and repair of larger vessels by domestic and foreign interests which cannot be accommodated by existing channel depths. Large vessel construction or repair work currently being performed by either foreign or domestic shipbuilders at greater costs than could be obtained at Bayou La Batre are oil supply vessels, crew vessels, U.S. military and Coast Guard vessels, and large research vessels. Also, due to the substantial increase in oil and natural gas exploration and production activity in Mobile Bay and the adjacent Gulf of Mexico, it is expected that split operations for the servicing and repair of vessels used in these operations will increase significantly under the future without-project condition. Diversification of commercial fishing is also occurring, as evidenced by the developing butterfish fishing and processing market, which require larger vessels for operational efficiency.

ALTERNATIVE PLANS CONSIDERED

A vast array of alternative plans was formulated for the project. This array consisted of varying combinations of channel depths, channel segments and alignments, and dredged material disposal measures. Alternative project navigation depths ranged from 14 feet to 22 feet. Two channel alignment alternatives within Mississippi Sound and nine dredged material disposal alternatives were considered and quantified. Additionally, channel extensions into Snake Bayou and the upper Bayou La Batre were formulated incrementally and added to the plan selected for the lower bayou and Mississippi Sound. In all, over 100 alternative plans were quantified and evaluated for the project.

RECOMMENDED PLAN

The recommended plan for the project is the national economic development (NED) plan and provides for:

> Deepening the existing Federal channel within Bayou La Batre to a navigation depth of 18 feet by 100 feet wide from the mouth of Bayou La Batre (130+00) to and including the existing turning basin (30+00).
>
> Deepening the existing Federal channel within Bayou La Batre to a navigation depth of 14 feet by 75 feet wide from the turning basin (30+00) to the Highway 188 bridge crossing (0+00).
>
> Extending the 14-foot by 75-foot channel from the Highway 188 bridge crossing within Bayou La Batre to Sta. -15+10 above the bridge.
>
> Extending a 14-foot by 50-foot channel from the turning basin into Snake Bayou to Sta. 5+33, then a 12-foot by 50-foot channel within Snake Bayou to Sta. 13+47.
>
> Extending and widening the existing 12-foot by 100-foot Federal channel within Mississippi Sound to connect with the Gulf Intracoastal Waterway (GIWW) alignment (536+00), then westward along the GIWW alignment to connect with the existing Pascagoula Ship Channel (1185+45). The recommended dimensions of this channel are 18 feet in depth by 120 feet in width.

Disposal of construction and maintenance dredged material from the channels within the bayou will be into upland disposal sites. Within Mississippi Sound, a portion of the construction dredged material will be used for island stabilization and marsh creation at Isle aux Herbes while the remainder of construction material will be disposed into open water at depths greater than 12 feet within Mississippi Sound. Maintenance material from the channel within Mississippi Sound will be disposed in open waters greater than 12 feet in depth.

PROJECT ECONOMICS

The elimination of fishing vessel delays awaiting favorable tides and the reduction in groundings for vessels risking shallow water conditions will benefit seafood harvesting and processing. Greater project depths will enhance the competitiveness of shipbuilding and vessel repair operations. The average annual benefits at 8 5/8 percent interest total $5,948,400 while the average annual costs are $2,188,900. The benefit to cost ratio of the recommended plan is 2.7 to 1.

The average annual benefits for the recommended plan are itemized as follows:

RECOMMENDED PLAN
BENEFITS BY ACTIVITY
BAYOU LA BATRE

	($1,000)
COMMERCIAL FISHING	
Shrimping, Damages & Delays	$ 761.1
Butterfishing, Operating Costs	1,717.2
Subtotal	$2,478.3
SHIPBUILDING	
Existing Split Operations	$ 295.5
Vessel Damages and Delays	544.2
New Large Vessel Construction	1,832.0
Snake Bayou, Damages & Delays	310.2
Above Hwy. 188, Damages & Delays	488.2
Subtotal	$3,470.1
TOTAL BENEFITS	$5,948.4

ENVIRONMENTAL IMPACTS

There are no major adverse environmental impacts resulting from project implementation; therefore, no environmental mitigation measures are required. About 107 acres of relatively low habitat value upland pine forest would be used as an upland disposal site. Estaurine bottom areas would be temporarily disturbed by dredging and dredged material disposal but with no long term adverse impacts on benthic populations. Construction of a berm at Isle aux Herbes with construction dredged material would provide protection for about 6,000 linear feet of shoreline and associated wetlands.

PROJECT FIRST COSTS

The total estimated first costs for construction of the recommended plan is $17.6 million. The non-Federal cost is $13.1 million, or 75 percent of the total project cost, while the Federal cost of the project is $4.5 million. The principle non-Federal cost will be the replacement of bulkheads within the bayou channel. These bulkhead replacements are estimated to cost $9.7 million. The Federal/non-Federal first costs for construction of the recommended plan are shown in the following table.

FEDERAL/NON-FEDERAL COSTS
RECOMMENDED PLAN

Feature	Federal Costs ($1,000)	Non-Federal Costs ($1,000)
Channels and Canals:		
Dredging, Channels	$ 4,541.0	$ 504.6
Aids to Navigation	48.8	0.0
SUBTOTAL	$ 4,589.8	$ 504.6
LERRD:		
Bulkhead/Pier Replacements	$ 0.0	$ 9,647.7
Utility Relocations	0.0	429.7
Upland Disposal Areas	0.0	1,237.5
E & D	0.0	577.1
S & A	0.0	657.2
SUBTOTAL	$ 0.0	$12,549.2
TOTAL FIRST COSTS	$ 4,589.8	$13,053.8

LOCAL COOPERATION

The State of Alabama signed a letter of intent, dated April 18, 1989, to provide the required non-Federal sponsorship for the project. The State will provide $6 million toward project construction and secure second party agreements with Mobile County and local interests for that portion of the non-Federal costs exceeding $6 million. The City of Bayou La Batre has provided a letter of intent, dated September 7, 1988, to provide financial assistance for a portion of the non-Federal cost exceeding that provided by the State of Alabama. In their letter, a number of options to raise the City's finances are discussed. The City has also passed a resolution, dated April 14, 1989 pledging financial support for the project.

REVISIONS TO THE FEASIBILITY REPORT

Revised pages have been included in this final Feasibility Report along with an added Appendix F. The report revisions are the result of the Washington level review of the project. Appendix F to the Final Feasibility Report contains economic reanalyses of butterfishing, shipbuilding split operations, and shrimping. The analyses contained in Appendix F supercedes all other discussions or evaluations of these items within the main report, specifically pages 56 through 61, and Appendix B, Economic Analysis.

2.0 Need For and Objectives of Action.

2.1 **Study Authority.** Authority for this study is contained in House Public Works Committee Resolution adopted on October 10, 1974. The resolution requested feasibility studies to determine if modifications to the existing navigation project at Bayou La Batre, Alabama, are warranted.

2.2 **Public Concerns.** The potential for development of the Bayou La Batre area is related to its historical development as a major fishing port on the gulf coast as well as its present day national ranking among commercial fishing harbors. In addition, more recent development of the boat building industry within the bayou has played an important role in expanding the economic base of Bayou La Batre and south Mobile County. Public concerns considered in the proposed study primarily center around the need for improved waterborne transportation facilities to support changing commercial vessel types, changes in commercial fishing activities, prospects for offshore oil and gas exploration service vessel activity, porting of small ships, and construction of vessels with a draft greater than 12 feet, the existing project depth. Public concerns were also expressed concerning the maintenance and or enhancement of the environment within the study area. The Main Report examines, in detail, the problems, needs, and opportunities of the study area at Bayou La Batre, Alabama.

2.3 **Planning Objectives.** The planning objectives listed below are the basis from which alternative plans were formulated.

Increase the diversity of the fleet which could utilize the channel for commercial purposes.

Increase the economic efficiency of the interactive system of vessels, facilities, and navigational requirements by improving the channel to accommodate the existing fleet and larger, more cost effective vessels.

Improve navigational safety and reduce the risk of vessel groundings and damages.

Provide an adequate and acceptable dredged material disposal plan for project modifications and continued maintenance of the Bayou La Batre channel.

Coordinate dredging and disposal alternatives so that no conflicts arise with existing management plans for Gulf Islands National Seashore properties on Petit Bois and Horn Islands and the Coastal Area Management Programs of the State of Alabama and the State of Mississippi.

Avoid irreversible commitments of resources to future uses.

Maintain or enhance environmental quality of the bayou and Mississippi Sound.

Utilize dredged material for beneficial purposes such as erosion protection or habitat establishment.

3.0 Alternatives.

3.1 **Plans Eliminated from Further Study.** A large array of channel depths and widths and disposal sites were initially considered for implementation for the Bayou La Batre project, including those suggested by the public, State and local agencies, and Federal agencies as well as those conceived by the Corps of Engineers. These alternatives are discussed in detail in the Main Report. A number of these concepts were eliminated from further study during preliminary stages of the formulation process. Alternative concepts which were retained were subjected to more detailed analysis and of these, eleven concepts were carried forward as the final array of detailed alternatives. The alternatives discussed below were eliminated from further study in the intermediate stage of formulation.

3.1.1 **Channel Depth and Width.** Initial investigations had included depths of 13, 14, 15, 16, 17, 18, 20, and 22 feet. During the intermediate stage 13-, 15-, and 17-foot depths were eliminated. Widths from 100 to 200 feet were considered for the Mississippi Sound and entrance portions of the channel. All widths were eliminated except for 100 feet for the channel segment in the bayou and 120 feet for the channel segments in Mississippi Sound or westward along the GIWW alignment to the Pascagoula Ship Channel, and 150 feet through Petit Bois Pass into the Gulf of Mexico,. A summary of the economics for each channel segment is presented in Appendix E to the Main Report.

3.1.2 **Alternative Disposal Concepts.** The use of diked areas 'Alpha' and 'Beta' on the west side of the bayou were eliminated due to their limited size and the wetland nature of a portion of 'Beta'. One of the main considerations used in determining the suitability of an upland site is it's role in a long-term dredged material disposal plan. This plan which is being developed in conjunction with the improvements to the Bayou La Batre channel will provide disposal capacity for the bayou portion of the channel for a 50 year period. In addition, the maintenance needs for the bayou portion of the Bayou Coden channel are also being considered in this plan. Because of it's small size site 'Alpha' did not fit into the scheme for a long-term plan. In addition to restricted size, the dikes around site 'Beta' have deteriorated and permitted for tidal exchange into a portion of the site with a consequent development of wetland vegetation.

Upland disposal of material dredged from the entire length of the proposed channel, both new work and maintenance, was eliminated from consideration for economic and engineering considerations. The quantity of material to be dredged from the entire project over the 50 year project life is in excess of 16 million cubic yards. Disposal of this quantity of material would require approximately 1000 acres of upland to be purchased by the local sponsor. In addition, the proposed channel extends approximately 13 miles from the mainland shoreline. Pumping of dredged materials for this distance would result in excessive costs in light of the benefits to be gained from improving the channel.

Expansion of the existing disposal area, 'Charlie', through the addition of 20 acres on the west of the site was also eliminated from further consideration. With the enlarged area maintenance materials dredged from Station 30+00, approximately midway between the turning basin and the mouth, to approximately Station 220+00 in Mississippi Sound would be placed in the site. Pumping to the site from the channel segment within Mississippi Sound would require the addition of a booster pump. To break even with the costs associated with the booster pump approximately 210,000 cubic yards would have to be placed in the site every 3 years. Placing this quantity of material within the 90 acre site would result in attaining the design capacity of the site in approximately 30 years which is not consistent with the long term management goal of 50 years. The alternative of placing less than 210,000 cubic yards in the site, to achieve the long term goal, is not cost effective.

Island construction in Mississippi Sound was eliminated due to the lack of quantity of material for an island. Direct nourishment of the barrier islands was eliminated due to the costs associated with this disposal alternative. Disposal on the north side of Petit Bois Island was also eliminated. Extensive grassbeds are known to occur in the areas north of the barrier islands and disposal in these areas could result in significant impacts to this important habitat.

Open water disposal of new work material in waters less than 12 feet deep was eliminated due to the possibility of mounding and subsequent impacts on circulation. Impacts such as these have been observed in other areas, e.g. Pascagoula area, and it was determined that the impacts could be avoided by using deeper waters within Mississippi Sound. Open water disposal of maintenance material into these waters was also eliminated due to the proximity of the significant estuarine nursery areas of Portersville and Grand Bays and the possible impacts due to increased turbidity associated with this disposal alternative.

Gulf disposal of maintenance material from the Mississippi Sound portion of the channel was eliminated due to operational constraints. The size of the channel requires that a cutterhead or mechanical dredge preform the dredging, with material being placed in dump scows or hopper barges for transport to the Gulf. In order to gain an economical load these scows or barges would be overflowed until such a load was obtained. Recent experience with this type barge overflow operation in Mobile Bay has demonstrated that barge loading cannot be enhanced with the type maintenance material present in the Mobile Channel and with equipment presently available within the dredging industry. Studies of maintenance material from the Bayou La Batre channel indicate that it is of a similar nature and therefore Gulf disposal would not be economically feasible at this time. Gulf disposal of maintenance material from an alignment west to the Pascagoula Harbor Channel was eliminated due to the small quantity of material estimated to be removed and the excessive costs associated with removing small quantities and transport to the Gulf.

3.2 **Plans Considered in Detail.** Evaluations performed in the intermediate stage identified eleven conceptual channel segment/disposal alternative combinations which merited further study. Table EIS-2 presents a description of each of the disposal concepts on a channel segment basis.

TABLE EIS-2
Channel Segment/Disposal Alternatives

BAYOU CHANNEL SEGMENT

BA	New work and maintenance material to upland disposal areas Delta and existing Charlie.

MISSISSIPPI SOUND CHANNEL SEGMENT[1]

SA	New work material split between Point aux Pins and open water deeper than 12 feet. Maintenance material to open water greater than 12 feet deep.
SB	New work material split between Isle aux Herbes and open water deeper than 12 feet. Maintenance material to open water greater than 12 feet deep.
SC	New work material to Isle aux Herbes. Maintenance material to open water greater than 12 feet deep.
SD	New work and maintenance material to open water greater than 12 feet deep.
SE	New work material to Gulf of Mexico (ODMDS), only in conjunction with PB or GB. Maintenance material to open water greater than 12 feet deep.

PETIT BOIS PASS CHANNEL SEGMENT

PA	New work material in littoral zone. Maintenance material disposal rotating between littoral zone and ODMDS on an 18-month cycle.
PB	New work material to ODMDS, alone or in conjunction with SE. Maintenance material disposal rotating between littoral zone and ODMDS on an 18-month cycle.

GIWW CHANNEL SEGMENT[2]

GA	New work and maintenance material to open water approximately 5000 feet south of channel.
GB	New work material to Pascagoula ODMDS, only in conjunction with SE. Maintenance material to open water approximately 5000 feet south of channel.
GC	New work material in littoral zone 10,000 feet south of channel. Maintenance material to open water approximately 5000 feet south of channel.

[1] Options for open water disposal include:
direct placement approximately 2500 feet west of channel
thin-layer placement approximately 2500 feet west of channel
berm construction

[2] Options for open water disposal include:
direct placement
thin-layer

Combination of these channel/disposal concepts results in eighteen alternative plans as presented on Table EIS-3. It should be noted that each of the openwater disposal concepts can be modified depending on the technique of disposal utilized. The cost of the disposal concept would not change with change in technique, however the impacts associated with the use of the different technique are different. In addition five different depths, 14, 16, 18, 20, and 22 feet, are considered for each of the eighteen alternative plans. These alternatives, including the "No Action" alternative, make up the final array of alternatives. Table EIS-4 summarizes information contained in the Main Report related to plan economics for each depth considered. Based on this table the greatest net benefits are attained with an 18-foot channel (For more detail refer to Plan Formulation Section of the Main Report). In order to simplify the discussion in the EIS, the detailed alternatives analysis is made utilizing the 18-foot depth alternative. Table EIS-5 summarizes information related to plan economics for the 18-foot depth alternative. See Appendix B to the Main Report for more detailed discussion on the economic analysis.

TABLE EIS-3

Alternative Plans

ALTERNATIVE PLAN I	BA+SA+PA	ALTERNATIVE PLAN X	BA+SA+GA
ALTERNATIVE PLAN II	BA+SB+PA	ALTERNATIVE PLAN XI	BA+SB+GA
ALTERNATIVE PLAN III	BA+SC+PA	ALTERNATIVE PLAN XII	BA+SC+GA
ALTERNATIVE PLAN IV	BA+SD+PA	ALTERNATIVE PLAN XIII	BA+SD+GA
ALTERNATIVE PLAN V	BA+SA+PB	ALTERNATIVE PLAN XIV	BA+SE+GB
ALTERNATIVE PLAN VI	BA+SB+PB	ALTERNATIVE PLAN XV	BA+SA+GC
ALTERNATIVE PLAN VII	BA+SC+PB	ALTERNATIVE PLAN XVI	BA+SB+GC
ALTERNATIVE PLAN VIII	BA+SD+PB	ALTERNATIVE PLAN XVII	BA+SC+GC
ALTERNATIVE PLAN IX	BA+SE+PB	ALTERNATIVE PLAN XVIII	BA+SD+GC

3.2.1 "No Action" Alternative. Maintenance of the existing project provides waterborne transportation via: a 12- by 100-foot channel from the 12-foot contour in Mississippi Sound to a point about 2,800 feet below the State Highway 188 bridge, thence a channel 12 by 75 feet upstream to the bridge, for a total channel length of about 6.3 miles. A turning basin is provided about 0.6 mile below the bridge. Approximately 100,000 cubic yards of maintenance material removed from the bayou portion of the project is pumped to a 70 acre confined disposal site (Charlie) approximately midway between the communities of Bayou La Batre and Coden. Material removed from the Mississippi Sound portion of the project by hydraulic pipeline/cutterhead dredge is pumped to six 75 acre open water disposal sites along the western side of the channel (See Figure EIS-1). These sites range in depth from 3.5 to 10.5 feet in depth. Typically, 50,000 cubic yards of maintenance material is pumped to each of the sites on a 3 year basis.

TABLE EIS-4

Average Annual Costs and Benefits by Channel Segment and Depth[1]

Channel Segment (Depth)	Total Average Annual Benefits	Total Average Annual Costs[2]	Net Benefits	B/C Ratio
Sound, Petit Bois Pass Bayou to above Hwy 188 Bridge, Snake Bayou				
14 feet	2,074.3	2,274.3	(200.0)	0.91
16 feet	3,301.4	2,745.6	555.8	1.20
18 feet	**6,025.3**	**2,875.9**	**3,149.4**	**2.10**
20 feet	6,040.5	3,231.9	2,808.6	1.88
22 feet	6,040.5	3,446.5	2,594.0	1.75
Sound, GIWW, Bayou to above Hwy 188 Bridge, Snake Bayou				
14 feet	1,997.4	1,660.6	336.8	1.20
16 feet	3,224.5	2,030.7	1,193.8	1.59
18 feet	**5,948.4**	**2,188.9**	**3,759.5**	**2.72**
20 feet	5,963.6	2,490.5	3,473.1	2.39
22 feet	5,963.6	2,709.0	3,254.6	2.20

[1] These data are applicable to the most economical alternative plan, i.e., Plan II and Plan XI. Costs and Benefits are $1,000.

[2] These are net average annual costs and are composed of (Construction dredging + Maintenance dredging + Bulkhead replacement + Utility relocations) - (Bulkhead replacement without project + Maintenance dredging without project).

TABLE EIS-5

Summary of Selected Features of Alternative Plans at 18-Foot Depth[1]

	Economic Data[2]			Plan Designation
Plan	Annual Costs	Annual Benefits	B/C Ratio	
I	2,932.1	6,025.3	2.05	
II	2,875.9	6,025.3	2.10	
III	2,953.6	6,025.3	2.04	
IV	2,900.8	6,025.3	2.08	
V	3,055.4	6,025.3	1.97	
VI	2,999.2	6,025.3	2.01	
VII	3,076.9	6,025.3	1.96	
VIII	3,024.1	6,025.3	1.99	
IX	3,257.4	6,025.3	1.85	
X	2,245.1	5,948.4	2.65	
XI	2,188.9	5,948.4	2.72	NED
XII	2,266.6	5,948.4	2.62	EQ
XIII	2,213.8	5,948.4	2.69	
XIV	2,462.6	5,948.4	2.42	
XV	2,277.4	5,948.4	2.61	
XVI	2,221.2	5,948.4	2.68	
XVII	2,298.9	5,948.4	2.59	
XVIII	2,246.1	5,948.4	2.65	

[1] Including Snake Bayou and Turning Basin to 1500 feet above Bridge segments

[2] Costs and benefits are $1,000

The principal difficulties stemming from inadequate widths and depths throughout the existing channel would not be alleviated under this alternative. In addition to this economic handicap this alternative would not alleviate the safety problems associated with utilizing the channel.

3.2.2 **Channel Modification Alternatives.** All alternatives considered in detail included providing a 14- by 75-foot channel from the turning basin (Station 30+00) northward to the Highway 188 bridge (Station 0+00) then 12- by 75-foot to a point approximately 1500 feet above the Highway 188 bridge (Station -15+00). In addition the plan would provide a channel in Snake Bayou, 14- by 50-foot from the junction with Bayou La Batre to Station 5+33 then 12- by 50-foot to Station 13+47. Deepening of the existing 100-foot wide channel from the mouth of the bayou (Station 130+00) to the turning basin to 14-, 16-, 18-, 20-, and 22-foot depths was considered. Widening to 120 feet and deepening within Mississippi Sound to 14-, 16-, 18-, 20-, and 22-foot depths was considered in detail. Two channel alignments to the Gulf of Mexico were considered: 1) from Station 536+00 (GIWW crossing) southward through Petit Bois Pass and 2) from Station 536+00 westward to the Pascagoula Ship Channel. The dimensions considered for the channel through Petit Bois Pass included 150-foot wide at 15-, 17-, 19-, 21-, 23-foot depths. The dimensions of the channel west along the GIWW were 120-foot wide at 14-, 16-, 18-, 20-, and 22-foot depths. The depths indicated are nominal depths, actual depth would include 1-foot advanced maintenance and 1-foot allowable overdepth (See Figure EIS-2). For a more detailed description refer to the Main Report.

Dredging of the channels in Snake Bayou and above the Highway 188 bridge would impact approximately 1.5 and 2.6 acres of bayou bottoms, respectively. These bottoms have not been previously dredged. Dredging within the Bayou south of the bridge would impact approximately 29 acres of bottoms which are currently dredged on a 3 year cycle. Provision of a 14-foot channel would impact approximately 126 acres within Mississippi Sound north of the GIWW. No dredging would be required if the GIWW alignment were followed, approximately 51 acres south of the GIWW would be dredged with the Petit Bois Pass alignment. Provision of the 16-foot channel would impact 173 acres north of the GIWW and 73 acres south of the GIWW for the Petit Bois Pass alignment. Minimal dredging would be required for the GIWW alignment. Provision of an 18-foot channel would require dredging on 201 acres north of the GIWW, 140 acres south of the GIWW for the Petit Bois Pass Channel, or 159 acres in Mississippi Sound with the GIWW alignment. Similarly the 20-foot channel requires dredging 223 acres north of the GIWW, 170 acres south of the GIWW or 185 acres in Mississippi Sound for the GIWW alignment. The 22-foot channel requires dredging 245 acres north of the GIWW, 188 acres south of the GIWW, or 211 acres in Mississippi Sound along the GIWW alignment. As discussed in Section 3.2 a comparison of the average annual incremental costs and average annual benefits associated with each depth increment indicated that the greatest net benefits are achieved with the 18-foot depth increment, therefore this depth is analyzed in greatest detail in the following paragraphs.

The channel modification alternatives considered in detail utilize various combinations of disposal areas and are presented in comparative format in Table EIS-6 and described in detail below and in the Main Report (Figures EIS-2 and EIS-3).

3.2.3 DREDGED MATERIAL PLACEMENT ALTERNATIVES.

3.2.3.1 Upland Disposal Areas 'Charlie' and 'Delta'. Approximately 395,800 cubic yards of new work and approximately 3 million cubic yards of maintenance material, over the 50 year project life, dredged from Station 90+45 to Station -15+10 within the bayou and Snake Bayou would be placed into the new 107 acre upland disposal area 'Delta' (Figure EIS-3). Approximately 171,500 cubic yards of new work and 1,360,000 cubic yards of maintenance material dredged from the mouth of the bayou to Station 90+45 would be disposed in the existing 70 acre disposal area 'Charlie'. This

Table EIS-6 Comparison of Alternative Plans

Segment		No Action	Plan I	Plan II	Plan III	Plan IV	Plan V
Bayou Channel	NW	N/A	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
	OM	DA Charlie	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
Mississippi Sound	NW	N/A	Pt Aux Pins & OW > 12'	Isle a'Herbes & OW >12 '	Isle Aux Herbes	Open Water >12'	Point Aux Pins & OW >12
	OM	Open Water >12'	Open Water >12'	Open Water >12'	Open Water > 12'	Open Water >12'	Open Water >12'
Petit Bois Pass	NW	N/A	Littoral Disposal	Littoral Disposal	Littoral Disposal	Littoral Disposal	ODMDS
	OM	N/A	Littoral Disposal + ODMDS, 18 Month Cyc	Littoral Disposal + ODMDS, 18 Month Cyc	Littoral Disposal + ODMDS, 18 Month Cyc	Littoral Disposal + ODMDS, 18 Month Cyc	Littoral Disposal + ODMDS, 18 Month Cyc
GIWW		N/A	N/A	N/A	N/A	N/A	N/A

Segment		NO Action	Plan VI	Plan VII	Plan VIII	Plan IX	Plan X
Bayou Channel	NW	N/A	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
	OM	DA	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
Mississippi Sound	NW	N/A	Isle a'Herbes & OW > 12'	Isle a'Herbes & OW > 12'	Open Water > 12'	ODMDS	Point Aux Pins & OW > 12'
	OM	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'
Petit Bois Pass	NW	N/A	ODMDS	ODMDS	ODMDS	ODMDS	N/A
	OM	N/A	Littoral Disposal + OSDMS, 18 Month Cyc	Littoral Disposal + OSDMS, 18 Month Cyc	Littoral Disposal + OSDMS, 18 Month Cyc	Littoral Disposal + OSDMS, 18 Month Cyc	N/A
GIWW	NW	N/A	N/A	N/A	N/A	N/A	OW 5000'S of Channel
	OM	N/A	N/A	N/A	N/A	N/A	OW 5000'S of Channel

TABLE EIS-6 (cont.) Comparison of Alternative Plans

Segment		NO Action	Plan XI	Plan XII	Plan XIII	Plan XIV	Plan XV
Bayou Channel	NW	N/A	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
	OW	DA Charlie	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
Mississippi Sound	NW	N/A	Isle a'Herbes & OW > 12'	Isle Aux Herbes	Open Water > 12'	ODMDS	Point a'Pins & OW > 12'
	OW	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'
Petit Bois Pass	NW	N/A	N/A	N/A	N/A	N/A	N/A
	OW	N/A	N/A	N/A	N/A	N/A	N/A
GIWW	NW	N/A	OW 5000 ft S of Channel	OW 5000 Ft S of Channel	Open Water 5000 Ft S	Pascagoula ODMDS	Littoral 10000 Ft S
	OW	NA	Open Water 5000 Ft S of Channel	Open Water 5000 Ft S of Channel	Open Water 5000 Ft S of Channel	Open Water 5000 Ft S of Channel	Open Water 5000 Ft S of Channel

Segment		NO Action	Plan XVI	Plan XVII	Plan XVIII
Bayou Channel	NW	N/A	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
	OW	DA Charlie	DA Charlie and Delta	DA Charlie and Delta	DA Charlie and Delta
Mississippi Sound	NW	N/A	Isle a'Herbes & OW > 12'	Isle Aux Herbes	Open Water > 12'
		Open Water > 12'	Open Water > 12'	Open Water > 12'	Open Water > 12'
Petit Bois Pass	NW	N/A	N/A	N/A	N/A
	OW	N/A	N/A	N/A	N/A
GIWW	NW	N/A	Littoral 10000 Ft S	Littoral 10000 Ft S	Littoral 10000 Ft S
	OW	N/A	Open Water 5000 Ft S	Open Water 5000 Ft S	Open Water 5000 Ft S

dredging would be accomplished by cutterhead/pipeline dredge. Maintenance would occur on a 3 year cycle, with approximately 175,000 and 80,000 cubic yards being placed in 'Delta' and 'Charlie', respectively. This alternative is represented by the symbol BA and is common to all plans considered in detail.

3.2.3.2 **Point aux Pins and Placement in Open Water Greater than 12 Feet in Depth.** Approximately 2 million cubic yards of new work material would be dredged by cutterhead/pipeline dredge from the mouth of the bayou south to the GIWW. Approximately 1.3 million yards of this material would be used to reestablish the eroded shoreline in the Point aux Pins/Isle aux Dames area (Figure EIS-4). The remaining material would be disposed in open water greater than 12 feet in depth on the western side of the channel (Figure EIS-2). This material could be: 1) used to create a submerged berm, 6 feet high x 40 feet wide on the crest and 1250 feet wide at the base x 4500 feet long, in the vicinity of the 12-foot contour on the west side of the channel; 2) placed on approximately 600 acres of estuarine bottoms approximately 2500 feet west of the channel; or 3) placed in a thin-layer, 1-foot thick or less, over approximately 750 acres of bottoms west of the channel. Approximately 430,000 cubic yards of maintenance material would be dredged by cutterhead/pipeline dredge every 3 years and disposed in open water greater than 12 feet deep for a total of 7.3 million cubic yards over the life of the project. This material could be placed directly on approximately 330 acres or placed in a thin layer over approximately 415 acres.

Approximately 260 acres south of the Point aux Pins/Isle aux Dames shoreline would be utilized in the creation of wetlands and provision of erosion protection. As shown on Figure EIS-4, a double row of hay bales, one bale high, would be placed along approximately 8000 feet of shoreline extending from the western tip of Point aux Pins eastward through the remanent of the Isle aux Dames. A double row of hay bales, two bales high, would be established from the ends of the first row extending southward for a distance of approximately 1500 feet. A third row of hay bales would be placed along this outer limit in water approximately 3 feet deep MLW. The placement of materials would begin at the Point aux Pins shoreline with discharge oriented toward the south. As material builds in this area the discharge line would be moved to the east and south. Wetland vegetation, Spartina alterniflora and Juncus roemerianus, would be planted on approximately 160 acres following disposal. Spartina alterniflora, in the form of plant rolls, would be installed on approximately 60 acres along the southern edge. The remainder of the 160 acre area would be sprigged on 3 foot centers using S. alterniflora or J. roemerianus as appropriate. Discharge would require approximately 3 months and would be accomplished between November and March to take advantage of low water levels. Planting would begin as soon after placement as possible but no later than April - May.

This placement alternative is represented by the symbol SA and is a component of alternative plans I, V, X, and XV.

3.2.3.3 Isle aux Herbes Placement Concept A and Placement in Open Water Greater than 12 Feet in Depth. Approximately 2 million cubic yards of new work material would be dredged by cutterhead/pipeline dredge from the mouth of the bayou south to the GIWW. Approximately 1.3 million yards of this material would be used to create an emergent berm along the northeastern shore of the Isle aux Herbes, east of the Bayou La Batre channel (Figure EIS-5). The remaining material would be disposed in open water greater than 12 feet in depth on the western side of the channel (Figure EIS-2). This material could be: 1) used to create a submerged berm, 6 feet high x 40 feet wide on the crest and 1250 feet wide at the base x 4500 feet long, in the vicinity of the 12-foot contour on the west side of the channel; 2) placed on approximately 600 acres of estuarine bottoms approximately 2500 feet west of the channel; or 3) placed in a thin-layer, 1-foot thick or less, over approximately 750 acres of bottoms west of the channel. Approximately 430,000 cubic yards of maintenance material would be dredged by cutterhead/pipeline dredge every 3 years and disposed in open water greater than 12 feet deep for a total of 7.3 million cubic yards over the life of the project. This material could be placed directly on approximately 330 acres or placed in a thin layer over approximately 415 acres.

Approximately 160 acres adjacent to the northeast shore of Isle aux Herbes would be utilized during the disposal of new work material. During the detailed design any change in the proposed area due to long-term management activities of the Bayou Coden Channel will be taken into account. As shown on Figure EIS-5, a double row of hay bales, two bales high, would be established east of the 3-foot contour and a single row of bales would be placed east of the existing shoreline. The placement of materials would generally be along the 3-foot contour, beginning in the north and proceeding southward. The emergent berm would be approximately 6 feet high (3 feet above MLW), 10-foot wide at the crest, 1000-foot wide at the base, and approximately 6,000 feet long. A swale would be created between the existing shoreline and the crest of the berm. Discharge would require approximately 3 months and would be accomplished between November and March to take advantage of low water levels.

This alternative placement concept is represented by the symbol **SB** and is a component of alternative plans II, VI, XI, XVI.

3.2.3.4 **Isle aux Herbes Placement Concept B and Placement in Open Water Greater than 12 Feet in Depth.** Approximately 2 million cubic yards of new work material would be dredged by cutterhead/pipeline dredge from the mouth of the bayou south to the GIWW. This material would be used to create an emergent berm along the eastern shore of the Isle aux Herbes, east of the Bayou La Batre channel (Figure EIS-6). Approximately 430,000 cubic yards of maintenance material would be dredged by cutterhead/pipeline dredge every 3 years and disposed in open water greater than 12 feet deep for a total of 7.3 million cubic yards over the life of the project (Figure EIS-2). This material could be placed directly on approximately 330 acres or placed in a thin layer over approximately 415 acres.

Approximately 240 acres adjacent to the eastern shore of Isle aux Herbes would be utilized during the disposal of new work material. During the detailed design any change in the proposed area due to long-term management activities of the Bayou Coden Channel will be taken into account. As shown on Figure EIS-6, a double row of hay bales, two bales high, would be established east of the 3-foot contour and a single row of bales would be placed east of the existing shoreline. The placement of materials would generally be along the 3-foot contour, pipeline routes would be located around the northern end of the island, through the cut in the center of the island, and around the southern end of the island. The emergent berm would be approximately 6 feet high (3 feet above MLW), 10-foot wide at the crest, 1000-foot wide at the base, and approximately 9,500 feet long. A swale would be created between the existing shoreline and the crest of the berm. Discharge would require approximately 6 months to complete and would be accomplished between October and March to take advantage of low water levels..

This alternative placement concept is represented by the symbol **SC** and is a component of alternative plans III, VII, XII, and XVII.

3.2.3.5 **Placement in Open Water Greater than 12 Feet in Depth.** Approximately 2 million cubic yards of new work material dredged from the Mississippi Sound Channel segment would be disposed in open water greater than 12 feet in depth (Figure EIS-2). Disposal of this material could be utilized to create an underwater berm approximately 6 feet high x 40 feet wide on the crest x 1250 feet wide at the base x 8400 feet long feet long (approximately 240 acres). This material could also be placed directly on approximately 1100 acres of bottoms, or placed in a thin-layer over approximately 1400 acres of bottoms. Approximately 430,000 cubic yards of maintenance material would be dredged by cutterhead/pipeline dredge every 3 years and disposed in open water greater than 12 feet deep for a total of 7.3 million cubic yards over the life of the project. This material could be placed directly on approximately 330 acres or placed in a thin layer over approximately 415 acres. This alternative placement concept is represented by the symbol **SD** and is a component of alternative plans IV, VIII, XIII, and XVIII.

3.2.3.6 **Placement in an Ocean Dredged Material Disposal Site in the Gulf of Mexico and in Open Water Greater than 12 Feet in Depth.** Approximately 2 million cubic yards of new work material would be dredged by cutterhead/pipeline dredge from the Mississippi Sound Channel and transported in hopper barges for placement in either the Mobile North ODMDS or the Pascagoula ODMDS (Figure EIS-2). Approximately 430,000 cubic yards of maintenance material would be dredged by cutterhead/pipeline dredge every 3 years and disposed in open water greater than 12 feet deep for a total of 7.3 million cubic yards over the life of the project. This material could be placed directly on approximately 330 acres or placed in a thin layer over approximately 415 acres. This alternative placement concept is represented by the symbol **SE** and can only occur in combination with **PB** or **GB** as discussed below. Alternative plan IX includes this placement option in conjunction with **PB**, alternative plan XIV includes this placement option in conjunction with **GB**.

3.2.3.7 Placement in the Petit Bois Pass Littoral Zone and Mobile North ODMDS. Approximately 872,000 cubic yards of new work material would be dredged by cutterhead/pipeline dredge from the channel through Petit Bois Pass between the GIWW and the Gulf of Mexico and disposed in the littoral zone of Petit Bois Pass, west of the channel (Figure EIS-2). Approximately 525,000 cubic yards of maintenance material would be dredged from this area every 18 months for a total of 17 million cubic yards over the project life. This material would be dredged by hopper dredge and disposed in the Mobile North Ocean Dredged Material Disposal Site (ODMDS) and by cutterhead/pipeline dredge and disposed in the littoral zone on a 18 month basis. The cutterhead/pipeline dredge would be utilized when the remainder of the project was maintained. The hopper dredge would be utilized during off year maintenance. This placement alternative is represented by the symbol **PA** and is a component of alternative plans I, II, III, and IV.

3.2.3.8 **Placement in the Mobile North ODMDS and Petit Bois Pass Littoral Zone.** Approximately 872,000 cubic yards of new work material would be dredged by hopper dredge from the channel through Petit Bois Pass between the GIWW and the Gulf of Mexico and transported to the Mobile North ODMDS for disposal (Figure EIS-2). Approximately 525,000 cubic yards of maintenance material would be dredged from this area every 18 months for a total of 17 million cubic yards over the project life. This material would be dredged by hopper dredge and disposed in the Mobile North Ocean Dredged Material Disposal Site (ODMDS) and by cutterhead/pipeline dredge and disposed in the littoral zone on a 18 month basis. The cutterhead/pipeline dredge would be utilized when the remainder of the project was maintained. The hopper dredge would be utilized during off year maintenance. This placement alternative is represented by the symbol **PB** and is a component of alternative plans V, VI, VII, VIII, and IX.

3.2.3.9 **Open Water Placement Approximately 5000 Feet South of the GIWW Channel.** Approximately 485,554 cubic yards of new work material and 90,000 cubic yards of maintenance material would be dredged from Station 536+00 to Station 1185+45 along the GIWW alignment and disposed in open water approximately 5000 feet south of the channel in depths of approximately 18 feet (Figure EIs-2). Maintenance would occur on a three cycle for a total of approximately 1.5 million cubic yards over the 50 year life of the project. The new work material could either be placed directly or in a thin layer less than 1-foot thick on approximately 330 or 400 acres, respectively. Placement of maintenance material would impact 70 or 90 acres utilizing direct placement or thin layer, respectively. This placement concept is represented by the symbol **GA** and is a component of alternative plane X, XI, XII, and XIII.

3.2.3.10 **Placement in the Pascagoula ODMDS and Open Water Approximately 5000 Feet South of the GIWW Channel.** Approximately 485,554 cubic yards of new work material from Station 536+00 to Station 1185+00 along the CIWW alignment would be dredged by cutterhead/pipeline dredge and transported in hopper barges to the Pascagoula ODMDS for disposal (Figure EIS-2). Approximately 90,000 cubic yards of maintenance material would be dredged from this channel segment every three years and placed in open water 5000 feet south of the channel for a total of 1.5 million cubic yards over the project life. Direct placement of this material would impact approximately 70 acres whereas placement in a thin layer would impact approximately 90 acres. This placement concept, represented by the symbol GB, is only viable in conjunction with SE described above and is a component of alternative plan XIV.

3.2.3.11 **Open Water Placement Approximately 10000 Feet and 5000 South of the GIWW Channel.** Approximately 485,554 cubic yards of new work material would be dredged from Station 536+00 to Station 1185+45 along the GIWW alignment and disposed in open water approximately 10000 feet south of the channel in depths of approximately 18 feet (Figure EIS-2). This material could either be placed directly or in a thin layer less than 1-foot thick on approximately 330 or 400 acres, respectively. Approximately 90,000 cubic yards of maintenance material would be dredged from this channel segment every three years and placed in open water 5000 feet south of the channel for a total of 1.5 million cubic yards over the project life. Direct placement of this material would impact approximately 70 acres whereas placement in a thin layer would impact approximately 90 acres. This placement concept is represented by the symbol GC and is a component of alternative plans XV, XVI, XVII, and XVIII.

3.2.4 **RECOMMENDED PLAN.** Features of the the plan recommended for the improvement of the Bayou La Batre channel include:

o Provision of a 18-foot channel from the mouth of Bayou La Batre to the turning basin.

o Provision of a 14- x 75-foot channel from the turning basin to approximately 1500 feet above the Highway 188 bridge.

o Provision of a 14- x 50-foot channel in Snake Bayou for a distance of 500 feet, then a 12- x 50-foot channel for approximately 850 feet.

o Provision of a 18- x 120-foot channnel from the mouth of the bayou into Mississippi Sound, south to the existing Gulf Intracoastal Waterway (GIWW) alignment then westward along the GIWW alignment to it's intersection with the Pascagoula Ship Channel.

o New work and maintenance materials dredged from Snake Bayou and the bayou proper channel will be disposed in upland disposal areas 'Charlie' and 'Delta'.

o The disposal of the new work material from the Mississippi Sound channel segment will be split between Isle aux Herbes and open water greater than 12 feet deep. The disposal at Isle aux Herbes will result in a 6,000 foot emergent berm along the northeast shore to provide protection to the existing wetlands in that area. The disposal of new work material in open water west of the channel will be placed on approximately 600 acres of estuarine bottoms. Maintenance material from this channel segment will be disposed in a thin-layer on approximately 415 acres on a three year cycle.

o The disposal of the new work and maintenance material dredged from the GIWW segment will be disposed in a thin-layer on approximately 400 and 90 acres, respectively, approximately 5,000 feet south of the channel alignment.

3.2.4.1 **BULKHEAD/PIER REPLACEMENT**. Both Bayou La Batre and Snake Bayou are extensively bulkheaded and numerous piers occur on both sides of the bayous (See Plates 5, 6, and 7 of the main report). From a point about midway between the mouth of the bayou (Station 130+00) and the turning basin (Station 30+00) to the study limits of the bayou (Station -15+00), the bayou is almost solidly bulkheaded on each side of the existing channel. There are presently over 20,000 linear feet of bulkhead and over 9,000 linear feet of pier within the bayous. Construction of the proposed channel would require replacement of approximately 6,300 linear feet of existing bulkhead to avoid potential bulkhead failure causing channel obstruction or damage to adjacent buildings or other infrastructure. In addition, approximately 1,800 linear feet of existing pier would need to be replaced. An additional 2,100 linear feet of bulkhead is needed to provide property protection for properties adjacent to the bayou that are currently without bulkheads and could be substantially affected by the side slopes of an improved channel. Replacement of existing bulkheads and piers and provision of new bulkheads is a responsibility of the local sponsor and/or individual property owner. Replacement of existing structures would be accomplished adjacent to the existing structures and utilizing, for the most part, materials similar to those currently in use. For new bulkheads, the most favorably 50-year cost results from use of anchored concrete bulkheads at all dredge line elevations. For additional information refer to Section IV, Engineering Analyses, of the Main Report and Appendix E, Engineering Data and Cost Estimates.

3.2.4.2 **UTILITY RELOCATIONS**. Utility relocations are required for two force mains, one 6-inch cast iron and one 6-inch PVC, which cross the channel below the Highway 188 bridge (See Plate 2 of the Main Report). The relocations of these force mains is a responsibility of the local sponsor and would be accomplished through directional drilling. Finished top of pipe elevations for the relocated force mains would be -10 feet MLW and -22 feet MLW for the PVC and cast iron line, respectively.

4.0 Affected Environment.

4.1 General Environmental Conditions. The Bayou La Batre navigation project is located in Mobile County in south Alabama. Bayou La Batre is a tidal stream about 10 miles long which empties into Mississippi Sound 30 miles southwest of Mobile, Alabama. The City of Bayou La Batre although small in population, 2,162 persons in the 1984 census, serves as a major port in the U. S. for commercial fishery landings. The Bayou La Batre study area consists of land and water bodies which may be directly or indirectly affected by the construction of a deeper channel at Bayou La Batre. This area includes the City of Bayou La Batre, pertinent portions of Mobile County, Mississippi Sound, and the Gulf of Mexico. For environmental aspects, a tiered study area is used such that the area or resources directly impacted by the construction of the channel are considered in more detail than those resources indirectly affected. The area which would be directly impacted includes the mainland region from the City of Bayou La Batre westward to the Alabama/Mississippi state line; that portion of Mississippi Sound between Isle aux Herbes and the Pascagoula, Mississippi Ship Channel approximately 30 miles to the west; and portions of the nearshore Gulf of Mexico and it's fishery resources. The channel under study is divided into four segments: 1) the Bayou Channel Segment from Station -15+10 upstream of the Highway 188 bridge to Station 130+00 at the mouth of the bayou and also including Snake Bayou; 2) the Mississippi Sound Channel Segment from Station 130+00 at the mouth to Station 536+00 which is in the vicinity of the Gulf Intracoastal Waterway (GIWW); 3) the Petit Bois Pass Channel Segment from Station 536+00 south through Petit Bois Pass to the 26-foot contour in the Gulf of Mexico; and 4) the GIWW Channel Segment from Station 536+00 west to Station 1185+45 at the junction with the Pascagoula Ship Channel (Figure 13, Main Report). Although referenced in this document the Gulf Intracoastal Waterway and the Pascagoula Ship Channel are not part of this study.

The major biotic communities within the project area are nearshore Gulf of Mexico, estuarine open waters, emergent wetlands, aquatic beds, wetland and upland forests, and urban areas. Numerous game animals and migratory waterfowl utilize the diverse habitats of the study area. Commercial fisheries utilize the wetland and open water areas throughout their life cycles. A number of threatened or endangered species may occur within the study area.

4.2 Significant Resources. The following paragraphs summarize the significant resources occurring within the study area which may be impacted by the proposed action. For a more detailed discussion, the reader is referred to the Existing Conditions Section of the Main Report and to the Mississippi Sound and Adjacent Areas Study (USACE, 1984).

4.2.1 Vegetation. Emergent wetlands comprise about 16 percent of the habitats in the study area. Most of these emergent wetlands are located along the shoreline of Point aux Chenes Bay, Portersville Bay (Point aux Pins area) and on Isle aux Herbes, and Petit Bois and Dauphin Islands. These wetlands are typically brackish or saline and are dominated by black needlerush with smooth cordgrass locally abundant along open water margins.

Salt flats occur within the saline marshes and are characterized by barren areas interspersed with glasswort and sea bite. Aquatic grassbeds comprise about 1 percent of the habitats of the study area. These are most dominant in shallow waters near the southeasternmost end of Portersville Bay, north shores of the barrier islands, and along the western and eastern shores of the Point aux Pins.

Forested wetlands comprise approximately 5000 acres of the study area. These areas may be moist pine savannahs/pitcher plant bogs characterized by a slash pine overstory with an understory of insectivorous plants such as pitcher plants and sundew in wetter areas and wax myrtle in drier areas. Floodplain swamps are also found within the general study area. These are characterized by sweet bay, swamp tupelo, water oak. Open thickets within the floodplain swamps are characterized by black titi and swamp cyrilla.

4.2.2 **Aquatic Resources.** Estuarine and Gulf of Mexico open water areas dominate the delineated study area. These areas range in depth from less than 1-foot MLW to depths greater than 60 feet and contain a variety of resources important to the functioning of the ecosystem.

Intertidal and subtidal bottoms are populated by communities of macrofauna whose structure is dependent upon substrate, salinity, temperature, depth, and ecological relationships. Of the five benthic communities which have been identified within the study area, the open sound, muddy-sand community occupies over 70% of the study area. Although there are no oyster reefs within the study area, the Cedar Point reef, the largest in Alabama, is just east of the study area. In addition oyster reefs were historically located in both Portersville and Grand Bays however with the widening of Petit Bois Pass salinities increased in these areas and influx of oyster predators resulted in almost total decline of these reefs. A recent shell planting activity resulted in the planting of approximately 2700 barrels of shell in the area adjacent to the northeast shoreline of the Isle aux Herbes.

The major fisheries of the study area include menhaden, mullet, croakers, brown and white shrimp, blue crab, and oysters. The Bayou La Batre area ranks in the top 20 for value of fishery landed at major U. S. ports. Seven-year average (1980-86) of landings and value were 20.2 million pounds and 31.8 million dollars. Shrimp, the dominant fishery landed in the bayou, accounted for approximately 90% of the total value. These species and others landed in the bayou are estuarine dependent, i.e., they spend part or all of their lives in estuaries. A typical estuarine dependent species spawns in the Gulf of Mexico, and the larvae are then carried into the estuaries where they mature. The stage from the egg to juvenile, during which transport from offshore waters to low salinity areas is accomplished, is probably the most critical of all in the life histories of the important fishery organisms of the northern Gulf of Mexico. The threat to individuals during this time may be broken down into three distinct phases: (1) transport from the offshore waters to the vicinity of the tidal passes; (2) transport through the passes into the estuaries; and (3) distribution within the estuaries after entrance has been obtained (Gunter, 1967). Since these forms are typically incapable of sustained locomotion, any significant increase or decrease in flow through the barrier island pass could impact the migration of these forms.

The mainland margins of the Sound, the margins of Dauphin and Petit Bois Islands, and the grassbeds around these islands and Point aux Pins serve as the dominant nursery grounds during the spring and summer months. In autumn these areas are still important, but usage is not as heavy due to the seaward migration of many late juveniles (Benson, 1982 and USACE, 1984).

4.2.3 **Wildlife Resources.** A number of amphibians and reptiles occur in the diverse habitats of the study area including salamanders, frogs, toads, snakes, and turtles. Five species of sea turtles are found in nearshore Gulf waters. The coastal marshes, swamps, islands, and beaches of the study area support large populations of passerine birds, waterfowl, wading birds, and shore birds. Several active nesting sites are located within the study area including an egret rookery on Petit Bois Island, a heron rookery on Isle aux Herbes, and a large rookery on Cat Island to the east. A number of marine mammals may be found within the study area including 3 species of whales, dolphins, and an occasional manatee. Coastal mammals common to the area include squirrel, nutria, muskrat, white-tail deer, raccoon and others.

4.2.4 **Endangered and Threatened Species.** In April, 1987, threatened and endangered species information for the vicinity of Bayou La Batre was requested from the Fish and Wildlife Service and the National Marine Fisheries Service. The Fish and Wildlife Service has indicated that the western population of the gopher tortoise (*Gopherus polyphemus*), a threatened species, occurs from the Tombigbee and Mobile Rivers in Alabama to southeastern Louisiana. Habitat for the gopher tortoise is well-drained sandy soils in transitional areas and it is commonly associated with a pine overstory with grass and forb groundcover and sunny areas for nesting.

The National Marine Fisheries Service indicated that a number of threatened and endangered species may occur off the coast of Alabama including: the finback whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), sei whale (*B. borealis*), green sea turtle (*Chelonia mydas*), Kemp's (Atlantic) ridley sea turtle (*Lepidochelys kempi*), leatherback sea turtle (*Dermochelys coriacea*), and the loggerhead sea turtle (*Caretta caretta*).

Finback whales are cosmopolitan and occur in all oceans. In the Gulf of Mexico this species is present through the year and sightings at sea have been recorded in the northern Gulf between 28 and 30 latitude and 86 and 88 longitude. Strandings have been recorded along Florida, Texas, and Louisiana (Schmidly 1981). Humpback whales also occur in all oceans, however prior to 1981 the only recent record for the Gulf of Mexico was in April 1962 at the mouth of Tampa Bay (Layne 1965). Other sightings have been in deep water (>200 meters) off the Alabama/Florida coast. Sei whales strandings have been recorded from the coasts of Mississippi and Louisiana in the vicinity of the Mississippi River Delta (Schmidly 1981).

Although marine turtles occasionally enter estuaries (Behler and King 1979), they generally prefer higher salinity waters such as those of the Gulf of Mexico. Nesting may occur throughout the range but most nesting occurs on restricted areas of beach that the turtles return to each nesting season. Foraging areas are often very far from nesting beaches and in order to nest, turtles may migrate long distances. Mating generally takes place in offshore waters near the nesting beach and males rarely come ashore (Fuller 1978).

Green turtles are most abundant between 35 north and 35 south latitudes, particularly in the Caribbean. Immature turtles are found along the Florida west coast (Carr and Caldwell, 1956) and have been known to nest on the barrier islands of the northern Gulf coast in the past.

Only a small portion of loggerhead nesting occurs in the Gulf. About 90 percent of the total nesting effort in the United States occurs on the south Atlantic coast of Florida (Carr and Carr 1977). Christmas and Waller (1973) reported loggerhead nestings on the beaches of the Mississippi Sound barrier islands. Ogren (1977) stated that historically the loggerhead nested on the remote beaches of Cat, Ship, Horn, Petit Bois, and Dauphin Islands. Human disturbance, natural predation, and island development have reduced the use of the barrier islands for nestings. Normally 1 to 2 loggerhead crawls are noted on the Mississippi barrier islands each year. One nesting attempt was noted on June 7, 1987, on east Ship Island which represents the only confirmed nesting attempt on the Mississippi Islands in the last four years (T. Simons personal communication).

The leatherback is probably the most oceanic of all sea turtles, preferring deep waters (Rebel 1974). It occasionally enters shallow waters and estuaries usually in the more northern waters of it's range (Barbour 1972). Leatherbacks are frequently seen in the Gulf of Mexico and are seasonally abundant off the Florida coast near Panama City (Pritchard 1976).

Kemp's ridley sea turtles are probably the most endangered of the sea turtles in the Gulf of Mexico. Their nesting is restricted,to a small stretch of beach near Rancho Nuevo, Ramaulipas, Mexico. Immature ridley's are regularly encountered (strandings) in the Mississippi Sound and adjacent to the barrier islands (R. Smith, National Park Service). Ogren (personal communication) indicated that this species tends to congregate in shallow water vegetated areas within the estuaries.

4.2.5 **Air Quality**. Air quality for the entire state of Alabama is considered good. Recently problems with air quality in Bayou la Batre have arisen due to emissions from the seafood byproduct processing plant located near the southern end of the bayou. Efforts are underway to correct this problem.

4.2.6 **Water Quality**. Surface water quality in the study area is highly variable depending on several factors including nonpoint and point source municipal and industrial loadings and their respective quality, rainfall, urbanization and concentration, and degree of dilution and /or mixing with estuarine waters. The water quality of the study is generally classified for recreation, fish-and wildlife, and shellfish harvesting. However, the bayou proper and nearshore Mississippi Sound have poor water quality due to a currently malfunctioning sewage treatment facility, runoff from the industrial yards, and activities associated with the fishing fleet. Due to these degraded water quality conditions, especially elevated fecal coliform bacteria counts, the bayou and adjacent waters are closed to shellfish harvest.

The major problem with the sewage treatment facility is caused by regulations that require the seafood processing houses to put process waters into the sewage collection and treatment system. These waters are characterized by extremely high biological oxygen demand and organic content. When the houses are operating, the volume of water supplied to the treatment system is in excess of design capacity. In an effort to remedy this problem one private entity has constructed an outfall line into Mississippi Sound for the process water from their facilities. A second line is under construction which will be operated and maintained by the City. This line has an interim design and ultimate load capacity of 2.3 and 7.2 million gallons, respectively. In addition to alternatives for process waters, the City has recently awarded contracts for the upgrading of the treatment facility with the addition of sludge drying beds.

A detailed discussion of water quality within Bayou La Batre, Mississippi Sound, and the nearshore Gulf of Mexico is presented in the Existing Conditions Section of the Main Report.

4.2.7 **Circulation.** Circulation patterns within the study are controlled by astronomical tides, winds, and to a small degree freshwater discharge. In Mississippi Sound and adjacent gulf waters the tidal variation is diurnal with an average period of 24.8 hours. The effect of wind on circulation in this area is significant not only in controlling circulation patterns but also in affecting water surface elevation. Analysis of wind records and sea level elevation for the period (1974-83) for coastal Alabama indicated that the passage of winter cold fronts during October through March caused significant perturbations in sea level (Schroeder and Wiseman, 1985). As these fronts move through the area an abrupt reversal of prefrontal conditions (southerly winds, falling barometric pressure, and warm moist air) was noted. Most significant during and immediately after passage is rising barometric pressure and wind direction shift to northerly. The seas and sea level, set up by the prefrontal southerly winds, are set down by the strong northerly winds and rising pressure. Schroeder and Wiseman detected differences in sea level elevation between prefrontal set up and post-frontal set down of 2.5 to 3.0 feet NGVD over periods of 12 to 24 hours.

Water velocities range between 0 to 3 feet per second (fps) in the barrier island passes and between 0 to 0.8 fps in the sound. Wave intensity on the Alabama/Mississippi shelf is low to moderate with wave periods ranging from three to eight seconds and wave heights rarely over 7 feet. Hurricane or storm conditions, however, may produce larger waves (USACE, 1984).

4.2.8 Sediment Quality. Soils within the bayou portion of the project consist of inorganic clays of high plasticity, poorly-graded sands, sand-silt mixtures, and sandy-clay mixtures. In this area the upper 2 to 5 feet of material consists of very soft, black to dark gray clay. This material has the consistency of grease, a very high percentage of water by weight, and contains organic material in concentrations of 8 to 24% by weight. Most of the material below -18 MLLW in this area consists of higher quality soils including sands and sand-silt-clay mixtures. Soils within Mississippi Sound consist of inorganic clays of high plasticity, poorly graded sands, sand-clay mixtures, sand-silt mixtures, and inorganic clays of low to medium plasticity. Sands and sandy mixtures decrease greatly in significance from the mouth of the bayou southward for a distance of approximately 28,000 feet. Clays increase in significance along this reach and become dominant between 28,000 and 53,500 feet. Sandy material begins to show up in the soil profile in this area (8300 feet south of the Gulf Intracoastal Waterway) and becomes dominant through the tidal pass into the Gulf of Mexico. Firm to stiff clays are encountered throughout the channel at depths of -18 MLLW in the northern portion of the sound to -22 MLLW in the vicinity of the Gulf Intracoastal Waterway.

Past studies of sediments from within the bayou and in Mississippi Sound indicated highly variable concentrations of nutrients, heavy metals, high molecular hydrocarbons, and pesticides. Mercury, arsenic, copper, zinc, cadmium, and lead were found to occur in concentrations greater than crustal abundance. In addition pesticides such as chlordane, DDD, DDT, and dieldrin, and PCB's had been reported from the area. Toxicity and bioaccumulation studies were performed by the Environmental Protection Agency as part of this feasibility study. Results of these studies indicated that the toxicity of the samples tested were minimal and that bioaccumulation of contaminants by the organisms tested was not significantly different between reference and test animals. These studies indicate that the materials to be dredged from the proposed project are suitable from a contaminant standpoint for disposal in open water. (For more details see the Existing Conditions Section of the Main Report and Section 2 of Appendix D to the Main Report.

4.2.9 Groundwater Resources. The principal sources of groundwater in Mobile County are the Miocene-Pliocene and alluvial aquifers. Wells tapping the Miocene-Pliocene aquifer range in depth from 100 to 800 feet and produce water that is generally soft and low in dissolved solids. In some instances this water may contain excessive levels of iron and be sufficiently acidic to be corrosive. The alluvial aquifer produces water generally suitable for most uses but may contain excessive levels of iron and be corrosive. In areas close to Mississippi Sound water may have dissolved solids in excess of 1,000 mg/l, a sulfurous odor, and chlorides in excess of 500 mg/l (Reed and McCain, 1972). The City of Bayou La Batre water system currently has capacity of up to 2 million gallons per day supplied from wells. Process water for the seafood processing houses is normally supplied by individual wells, however city water may sometimes be used.

4.2.10 **Land Resource and Use.** Of the land area within the designated study area, approximately 4000 acres are non-forested wetland, 4100 acres are forested wetland, and 900 acres are forested uplands. Approximately 1610 acres are designated as developed/urbanized lands (U.S. Army Corps of Engineers, 1984). Much of the development in the Bayou La Batre area is centered around the bayou and it's tributaries.

The barrier islands of the northern Gulf of Mexico are in an erosion/deposition cycle which results in the westward migration of the islands through time. This is especially evident with Petit Bois Island. Early in the 18th Century, Dauphin and Petit Bois Islands were one island. In about 1848 the island was breached and Petit Bois Pass has widened and migrated westward since this time (Hardin *et al.*, 1975). In addition the mainland shoreline, particularly in the Point aux Pins area and the shoreline of Isle aux Herbes experience significant erosion.

4.2.11 **Demography.** From the time of incorporation in 1955, bayou la Batre has maintained a relatively stable population except for the late 1970's and early 1980's. In 1984, the population of Bayou La Batre was 2,162 persons representing an increase of 9 percent over 1980 and a decrease of approximately 25 percent from 1970. This out-migration is probably due to a slump in the oil exploration industry. In addition, the City has not actively expanded it's limits to include much of the new housing within it's trade area.

4.2.12 **Economy.** Seafood harvesting and processing have traditionally been the primary source of employment and income for the area. Total annual employment is estimated to be 4500 persons. The major employers within the city include the ten major seafood processors (900 - 1200 annually), sixteen major shipbuilders (700 - 1000 annually), and an apparel manufacturer (500 annually). The remaining employment is in other marine related industries such as net making, trawl board manufacturing, outrigging, and small retail seafood houses.

In 1986, approximately 53.6 million pounds of seafood worth 100 million was handled at Bayou La Batre. Shipbuilding and vessel repair account for approximately 90 and 4 million annually. This represents sales of about 100 vessels a year and repairs to over 1000 vessels.

4.2.13 **Community Cohesion.** Two very generalized types of cohesion are exhibited by the citizens of the Bayou La Batre area. The first is a traditional type, based on long and cherished friendships, kinship ties, religious ties, and a sense of community developed out of many years of close interaction and interdependence. The second is much less important and is a more formalized economic type of cohesion.

4.2.14 **Recreational Opportunities.** The Alabama coast offers a diversity of recreational and cultural activities including fishing, hunting, boating, and beach activities. One public boat launching facility is currently under construction in the bayou.

4.2.15 **Noise.** Noise problems are those associated with day-to-day activities, such as traffic, construction, and shipbuilding. Noise levels are much higher in the vicinity of shipbuilding activities than in outlying areas.

4.2.16 **Aesthetics.** The aesthetic quality of the area ranges from excellent in the region of the barrier islands and Mississippi Sound to poor along the bayou proper. Much of the rest of the study area is variable in nature with well-kept residential neighborhoods to less aesthetically pleasing commercial areas.

4.2.17 **Transportation.** The Bayou La Batre area is supplied by Alabama State Highway 188 which connects with the Dauphin Island Parkway at Alabama Port to the east and US Highway 90 to the north and a number of small county maintained roads. The commercial air terminal at Mobile is approximately 30 miles north of the city and Interstate Highway 10 is approximately 20 north.

4.2.18 **Public Facilities and Services.** Alabama Power Company provides electricity to the study area from their generating plant on Blakeley Island, northeast of the city of Mobile. Water, sewer, and natural gas are supplied by the Utilities Board of Bayou La Batre. As discussed in Section 4.2.6 the existing sewage treatment facility is being upgraded.

4.2.19 **Cultural Resources.** The National Register of Historic Places has been consulted and there are no properties listed on or eligible for inclusion on the National Register that would be affected by the proposed navigation improvements. A number of locations within the general area of the proposed new disposal area have been surveyed and no archeological or historic properties were identified. As a result of consultations with the Alabama State Historic Preservation Officer, it was determined that the proposed new upland disposal area should be surveyed for cultural resources. The survey was conducted by Mobile District archeologists on September 2, 1988. No archeological sites or historic structures were identified. The Alabama State Historic Preservation Officer has concurred with the negative report of these investigations.

Documentary research conducted in 1986 to assess the potential for submerged properties along the Petit Bois Pass channel alignment revealed that there is very little potential for shipwrecks or other submerged properties in the vicinity of Bayou La Batre (Mistovich, 1987). The Alabama State Historic Preservation Officer has agreed that improving the Bayou La Batre channel through Petit Bois Pass will not affect cultural resources.

In 1983 documentary research for submerged cultural resources was conducted as part of the cultural resources investigations for the navigation improvements at Pascagoula Harbor, Mississippi. The Gulf Intracoastal Waterway (GIWW) alternative channel alignment in Alabama and Mississippi under consideration for the Bayou La Batre study was included in this literature search. The only reported wrecks identified in the vicinity of the GIWW were recorded since 1950 (Mistovich, et al., 1983). Thus, it is believed that the potential for significant submerged cultural resources is extremely low. Consultation with the Mississippi and Alabama State Historic Preservation Officers concerning the potential for effects to submerged cultural resources along the GIWW channel alignment has been initiated.

5.0 **Environmental Effects.** The following paragraphs describe the effects of each detailed plan on the previously described significant resources.

5.1 **Vegetation.** Under the "No Action" alternative any vegetation growing within existing disposal area Charlie would be impacted during maintenance activities every 3 years. Similar impacts would occur with implementation of each of the alternative plans. In addition approximately 107 acres of upland pine forest would be impacted during construction activities at new disposal area Delta with implementation of each of the alternative plans.

No emergent wetlands or submersed grass beds would be directly impacted by implementation of any of the alternatives. Implementation of plans I, V, X, and XV could indirectly affect the wetlands along the southern shore of Point aux Pins and the grassbeds along the eastern and western sides of the Point. These plans were formulated in an effort to utilize the new work material to be dredged from the Mississippi Sound Channel in a beneficial way by providing these areas with some measure of protection from the predominant wave approach. Implementation of any of these plans would result in the construction of a fan-shaped emergent/submergent area south of the Point aux Pins/Isle aux Dames shoreline (See Figure EIS-4). Approximately 160 acres of emergent wetland habitat would be established as part of the protection for the existing resources. Adverse impacts to the existing vegetative resources could occur from the increased turbidity associated with the disposal operation however extensive efforts have been taken to reduce the possibility of these impacts and it is believed that the benefits associated with protecting existing resources and providing additional resources outweighs the possible costs.

Currently undeveloped wetland areas adjacent to the bayou could be impacted by water dependent development with or without the construction of the recommended plan. Approximately 6.8 acres of wetlands along the east bank below Station 108+00; 0.4 acre of wetlands along the west bank above Station 106+75, including Snake Bayou; and 5.9 acres on the west bank below Station 106+75 are expected to come under development within the life of the project (See Figure 10, Main Report). Development of these areas, either through dredging or filling, would require individual Department of the Army permits. Mitigation for the impacts associated with filling these wetlands would be determined on a case-by-case basis at the time of application. Other wetland areas along the bayou have been exempted from development consideration at this time. These areas are typically pristine in nature; some are remote from the bayou and therefore not suitable for water dependent industry; and some serve as natural drainageways. Future development of these areas would be based on the need for the proposed development as well as the lack of practicable alternatives sites.

Implementation of any of alternative plans II, III, VI, VII, XI, XII, XV, or XVI would provide some protection to the wetland habitats along the eastern shore of Isle aux Herbes (See Figures EIS-5 and EIS-6). Implementation of any of these plans would not conflict with marsh establishment efforts associated with the long-term maintenance of the Bayou Coden Channel. Alternatives II, VI, XI, or XVI would provide protection for approximately 6,000 linear feet of shoreline while alternatives III, VII, XII, or XVI would provide protection for approximately 9,500 linear feet of shoreline. Implementation of these alternatives would not provide additional emergent wetland habitat.

As indicated on pages 24 - 28 of the Main Report and Section 4.2.10 of this EIS, the Isle aux Herbes is undergoing erosion of the northeast, east, and southwest portions of it's shoreline. The area in the vicinity of the proposed disposal area has lost approximately 276 feet over the period 1917 - 1958 or an average of 6.72 feet per year. The island is a very low profile area characterized by black needlerush with smooth cordgrass in a band at the water interface. Salt flats characterized by glasswort and sea bite are interspersed throughout the island. The provision of the berm as described above would provide wave protection and therefore reduce the ongoing erosion on the island.

5.2 **Aquatic Resources.** Under the "No Action" alternative, the macroinfaunal resources of the channel bottoms would continue to be disrupted by dredging on a 3 year cycle. In addition, the resources of the 4 shallow water disposal areas would be covered with 1 - 1.5 feet of dredged material (see Figure EIS-1). Although many of the organisms would be smothered, some would be able to migrate through this material. Other forms would migrate into the area or settle as larvae from the overlying water column such that repopulation of these areas would occur within 12 to 18 months. Motile aquatic resources such as shrimp, crabs and fish would tend to avoid the area where dredging and disposal options were ongoing. Larval and young age class aquatic organisms may become entrained during the dredging and disposal process due to their inability to avoid the area of operation. The degree of these impacts would vary with the location and temporal setting of the operations. Impacts would be expected to be most severe in spring/summer in the nearshore areas of Mississippi Sound. The impacts to the overall fishery of Mississippi Sound however, are unknown. No oyster resources are impacted under this alternative.

Dredging and disposal associated with the proposed navigation improvements would cause many of the same impacts described for the "No Action" alternative. Construction dredging within the Bayou Channel segment would result in the disruption of approximately 2.6 and 1.5 acres of undisturbed bottoms above the Highway 188 bridge and in Snake Bayou, respectively. Similar to the "No Action" alternative these bottoms and the 29 acres of bottoms encompassed by the existing project would continue to be disrupted every 3 years following construction. Within Mississippi Sound south to the GIWW, approximately 200 acres would be dredged. Of these 100 acres are currently disrupted during maintenance of the existing project. Dredging would result in the deepening of the bottoms to 18 feet, however since the open sound muddy sand habitat ranges from 6 feet to deeper than 18 feet there would be no change in habitat type. The major impact would be with the actual disruption, however the area should repopulate within 12 to 18 months and since the acreage is small in comparison to the total habitat available these impacts are not considered significant. These impacts are common to all plans considered in detail.

Alternative plans I - IX would result in the dredging of approximately 140 acres between the GIWW, through Petit Bois Pass to the 21-foot contour in the Gulf of Mexico. This area is naturally variable in depth and since the benthic community is controlled primarily by sediment texture and salinity no change in community structure is expected with depth increase. The major impact would be with the actual disruption, however the area should repopulate within 12 to 18 months and since the acreage is small in comparison to the total habitat available these impacts are not considered significant.

Alternative plans X - XVIII would result in the dredging of approximately 160 acres of bottoms in Mississippi Sound which currently range in depth from 16 to 18 feet. No change in community structure would occur with implementation of any of these alternatives. The major impact would be with the actual disruption, however the area should repopulate within 12 to 18 months and since the acreage is small in comparison to the total habitat available these impacts are not considered significant.

The disposal of approximately 1.3 million cubic yards of new work material from the Mississippi Sound Channel segment as proposed in plans I, V, X,and XV would result in the conversion of approximately 260 acres of shallow bottoms south of Point aux Pins/Isle aux Dames shoreline to emergent wetlands. The disposal of the remaining new work material would be disposed into waters greater of 12 feet deep which are characterized as open sound muddy sands. Construction of a submerged berm would convert approximately 130 acres to bottoms approximately 6 feet shallower. Since open sound muddy sand habitats are located in depths of 6 feet to greater than 18 feet there would be no change in habitat type. Construction of the berm could conflict with shrimp trawling in the area and could possibly result in a hazard to navigation.

Direct placement of the new work dredged material in areas approximately 2500 feet west of the channel would cover approximately 600 acres with a layer of dredged material approximately 2 feet thick. Some benthic organisms would be capable of migrating through 2 feet of dredged material, however most would be smothered. Studies have indicated that these communities are able to recover through migration and settlement of larvae within 12 to 18 months.

Thin layer disposal of the new work material would utilize approximately 750 acres with a final placement thickness of 1-foot or less. A larger number of benthic organisms are capable of migrating through a thinner layer of dredged such as that produced during thin layer disposal. Studies at Fowl River, Alabama and Gulfport, Mississippi indicate that recovery from thin layer deposition begins as early as 6 weeks after disposal operations were completed and that within 20 weeks there are no significant difference between disposal and reference areas (TAI, 1987,1988).

The disposal of approximately 1.3 million cubic yards of new work material from the Mississippi Sound Channel segment as proposed in plans II, VI, XI, and XVI would impact approximately 160 acres of shallow bottoms along the northeast shoreline of Isle aux Herbes. Of this area, approximately 60 acres would be converted to emergent bar while the remainder would become intertidal to shallow submerged in nature. The 2700 barrels of oyster shell planted along the northeast shore of the island would be relocated to deeper water in Portersville Bay. The disposal of the remaining new work material would occur in areas of Mississippi Sound with depths of 12 feet or more. The impacts associated with this portion of these alternatives would be similar to those described above for alternative plans I, V, X, XV.

The disposal of approximately 2 million cubic yards of new work material from the Mississippi Sound channel segment as proposed in plans III, VII, XII, XVII would impact approximately 240 acres of shallow bottoms along the northeast shoreline of Isle aux Herbes. Of this area, approximately 90 acres would be converted to emergent bar while the remainder would become intertidal to shallow submerged in nature. The 2700 barrels of oyster shell planted along the northeast shore of the island would be relocated to deeper water in Portersville Bay.

Alternative plans III, VII, XII, or XVII require the disposal of approximately 2 million cubic yards of new work material into areas of Mississippi Sound with depths of 12 feet or greater. Construction of a submerged berm with this material would convert approximately 240 acres to bottoms approximately 6 feet shallower. Since open sound muddy sand habitats are located in depths of 6 feet to greater than 18 feet there would be no change in habitat type. Direct placement of the dredged material in areas approximately 2500 feet west of the channel would cover approximately 1100 acres with a layer of dredged material 2 feet or less. Thin layer disposal would impact approximately 1400 acres with a final placement thickness of 1-foot or less. Recovery would be similar to that described for similar options in alternative plans II, VI, XI, XVI, however in the center of the disposal areas recovery may be somewhat slower due to the distance organisms would be required to migrate to these areas. Settlement of larvae from the water column should not be impacted by the size of the area impacted. Recovery may also be slowed compared to that described above due to the length of time required to complete construction of the channel with all disposal occurring in open water, i.e. 6 months vs. 3 months.

Implementation of alternative plans I thru IX and XIV would result in the disruption of an unknown acreage of bottoms within the Mobile North or Pascagoula Ocean Dredged Material Disposal Sites (ODMDS), respectively. The severity and duration of these impacts are not well known however historical use of this sites has not resulted in unacceptable impacts to the human environment.

Disposal of maintenance material dredged from the Mississippi Sound Channel segment involves deposition of approximately 430,000 cubic yards on a 3 year cycle. This material would be placed in waters greater than 12 feet in areas 2,500 feet west of the channel. Direct placement of the maintenance material would impact approximately 330 acres along the channel with dredged material approximately 2 feet thick. Placing the material in a thickness of 1-foot or less would impact about 415 acres. The impacts of these operations would be similar to those described for open water new work disposal, however due to the nature of the maintenance material a greater number of organisms would be expected to migrate through the dredged material. Studies have shown that benthic systems are able to recover from perturbations such as dredged material disposal within from as little as 6 weeks to as much as 18 months. This recovery period is highly dependent upon the level of disturbance, time of disturbance, and most importantly the type of benthic community being disturbed. In addition, during the period of recovery, the productivity from an area is still available to the estuarine system and the level of productivity from an area may shift during this recovery period. After disturbance of an area, early stage succession typically begins within a few days with the arrival of swimming crustaceans (i.e., amphipods and cumaceans) and more motile polychaetes and echinoderms (i.e., nereids and nephtyids and large ophiuroids) which immigrate into the disturbed area as adults from adjacent areas. More importantly however, the larvae of relatively opportunistic polychaetes and bivalve molluscs settle onto the new substratum from the overlying water column. These opportunistic species (Group I colonizers, McCall 1978) are characterized by short generation times, small size, high fecundity, and high larval availability. These species most commonly experience high mortality and may disappear as a result of competition and/or predation from the more motile immigrants. Later phases of succession are usually characterized by the gradual reestablishment of Group III species which are represented by the less mobile crustaceans, molluscs, and less opportunistic polychaetes. These species, in contrast to Group I colonizers, maintain more or less constant, relatively low population densities, are usually larger in size and exhibit lower fecundity and recruitment potential. Group II colonizers are intermediate in their life strategies.

Information collected during the Mississippi Sound and Adjacent Areas Study (Vittor and Associates 1982) indicates that in the areas generally considered for open water disposal of dredged material only Group I and II colonizers are present. Based on this information recovery in the areas in question would be relatively rapid and that the overall impact to the benthic system would be short-term and that the disposal of dredged materials on a three year cycle at these areas would not result in significant impacts to the estuarine system.

Construction of the channel through Petit Bois Pass requires dredging of approximately 872,000 cubic yards of new work material and approximately 525,000 cubic yards of maintenance material on an 18 month frequency. Deposition of new work material in the littoral zone of Petit Bois Island as described in plans I, II, III, and IV would impact an unquantifiable acreage of clean sand tidal pass habitat, however the organisms which inhabit these areas are adapted to very variable environmental conditions including wave and storm transport of sediments. In addition the placement of material into the littoral zone would act to continue the supply of sand to Petit Bois. Deposition of new work material in the Mobile North ODMDS as described in alternative plans V, VI, VII, VIII, and IX would result in the disruption of the benthic community occupying the disposal area.

Historical use of similar ODMDS for placement of sandy material has not resulted in unacceptable impacts. Deposition of maintenance material (all plans considered in detail) would occur on a rotating basis between the littoral zone and ODMDS therefore impacts would occur to each area every three years.

Alternative plans X, XI, XII, and XIII consider the deposition of new work material dredged from the GIWW Channel segment in areas 5000 feet south of the channel. Direct placement of this material would impact approximately 330 acres of open sound muddy bottoms. Thin layer deposition of this material would impact approximately 400 acres. The impacts to the benthic resources and their recovery would be similar to that described for open water disposal associated with the Mississippi Sound Channel segment.

Alternative plan XIV considers transportation of the new work material to the Pascagoula ODMDS in conjunction with material from Mississippi Sound. These impacts have been described above. Placement of the new work material in areas 10,000 feet south of the channel (littoral zone) as considered in alternatives XV, XVI, XVII, and XVIII would result in impacts similar to those described for open water disposal and for littoral zone disposal. Disposal of maintenance material from the GIWW segment (plans X thru XVIII) would impact 70 to 90 acres approximately 5,000 feet south the channel utilizing direct placement or thin layer placement, respectively. Impacts associated with this action would be similar to those described earlier for open water disposal of maintenance material and would occur on a three year cycle.

Due to the narrow bank-to-bank confines of the bayou in the upper reaches and the existing waterfront development, there are only about 3.5 acres of shallow waterbottoms (less than 4 feet MLW) in the bayou above Station 106+75 (See Main Report, Plates 1, 2, and 3 for station locations). Approximately 7 acres of shallow water habitat is located adjacent to the west bank below Station 106+75. Repair or replacement of existing bulkheads and construction of additional bulkheads for property protection associated with the improvement of the channel would not impact these resources. Future development, however, could result in the dredging or filling of these areas for water dependent industry. Due to the highly industrialized and confined nature of the bayou, these activities would not result in significant impacts to the aquatic resources of Mississippi Sound.

None of the plans considered in detail would impact any native oyster reefs, aquatic mammals, or reptiles.

Implementation of any of the alternative plans, although increasing efficiencies associated with the commercial fishing industry, is not expected to impact fishery resources of the Gulf of Mexico because of existing regulations promulgated by the Gulf of Mexico Fishery Management Council and State agencies. The development of the butterfish industry is an effort to tap a known resource in the Gulf. Should this industry prove profitable Gulfwide regulations may be required as have been proposed for the Atlantic butterfish.

5.3 Wildlife Resources. Under the "No Action" alternative, those wildlife species utilizing the existing upland disposal site would be impacted on a 3 year basis during maintenance of the existing project.

In addition to the impacts associated with the "No Action" alternative, implementation of any of the plans considered in detail would result in the displacement of wildlife from the 107 acres. Intensive management activities at the disposal area would preclude total reuse of the area by wildlife.

5.4 Endangered and Threatened Species. The "No Action" alternative would not impact any endangered or threatened species.

Endangered species coordination was initiated in April 1987. Lists of endangered and threatened species which may occur in the study area have been received from the US Fish and Wildlife Service (dated April 20, 1987) and the National Marine Fisheries Service (dated May 1, 1987). As required under Section 7 of the Endangered Species Act of 1973, as amended, the DEIS constituted the biological assessment.

The Fish and Wildlife Service indicated that the gopher tortoise (Gopherus polyphemus), which was at that time proposed for listing, could occur in the study area. Since the receipt of their letter this species has been listed as threatened. Habitat for the gopher tortoise is well-drained sandy soils in transitional (forest and grassy) areas and it is commonly associated with a pine overstory and open understory with a grass and forb groundcover and sunny areas for nesting. The proposed upland disposal area has soils of the Escambia series which consist of somewhat poorly drained soils with a highly weathered mixture of clay with quartz and other diluents formed from loamy marine sediments and therefore does not meet the habitat requirements of this species. No further consultation under the Endangered Species Act is required, unless circumstances relative to the recommended plan change. The Fish and Wildlife Service has concurred with this determination (See Appendix D, Section 6).

The National Marine Fisheries Service indicated that three species of whales and four species of marine turtles may be present in the study area. As indicated in Section 4.2.4 of this FEIS, whales are primarily restricted to open gulf waters and therefore would not be impacted by implementation of the recommended plan. Sea turtles may occur within the Mississippi Sound and may nest on the gulf beaches of the barrier islands as indicated in Section 4.2.4. Of prime importance is the Kemp's (Atlantic) ridley turtle which is considered to be the most endangered of the species listed for this area. This turtle is known from the Mississippi Sound and is typically associated with shallow vegetated habitats. The recommended plan does not require dredging or disposal near any shallow vegetated habitats therefore no impacts to this species are expected to occur. The other species occur less frequently within the sound and therefore would not be impacted by the proposed action. The National Marine Fisheries Service, by letter dated September 13, has concurred with the no impact assessment. No further consultation under the Endangered Species Act is required, unless circumstances relative to the recommended plan change.

5.5 Air Quality. For the "No Action" alternative the existing air quality within the project area would remain unchanged. The activities associated with dredging or disposal in all alternative plans would temporarily reduce local air quality levels due to exhaust emissions of the equipment used. The construction of the dikes around the new disposal area Delta would also temporarily reduce air quality in these areas due to exhaust emissions. These impacts are considered to be insignificant and would be limited to the immediate construction area. Any induced development into the area by the project improvement would be subject to State and Federal regulatory procedures to control emissions and protect the air quality.

5.6 Water Quality. For the "No Action" alternative, the existing water quality within the project area would remain the same or possibly improve in some areas while declining in other areas in the future. The completion of the seafood processing wash water outfall line and the upgrading of the sewage facility are expected to result in improvements in water quality. Open water disposal at the existing sites in Mississippi Sound would result in temporary localized increased in turbidity and nutrients and decreased in dissolved oxygen within the water column. Continued use of sites 7, 8, or 9 could result in shallowing of these areas with subsequent impacts to circulation and water quality (Figure EIS-1).

Return waters from existing disposal area Charlie cause temporary localized increases in turbidity and nutrients and decreases in dissolved oxygen within the water column in the vicinity of the outfall. Short term localized effects of this nature would also be present at the dredge cutterhead during maintenance operations.

The impact of disposal of sediments from the Bayou la Batre channels in open water on marine organisms has been evaluated by the Environmental Protection Agency (1988) following standard toxicity and bioaccumulation procedures. Results of these evaluations indicate that the toxicity of the materials proposed for disposal are minimal. In addition residues of selected pesticides and PCB's were not detected in either sediments or animal tissue before or after exposure. Some heavy metals were detected, especially in sediments from the bayou proper and organisms exposed to these sediments. Petroleum hydrocarbon residues were also detected in tissue samples from organisms exposed to sediments, however levels were not significantly different from organisms not exposed to the sediments.

Use of the upland disposal sites for materials from the Bayou Channel segment would have similar impacts to the "No Action" alternative. The return water from the new upland disposal and existing disposal area Charlie would cause short term localized impacts on turbidity, nutrient concentrations, and dissolved oxygen levels within the water column in the vicinity of the outfalls. Short term localized effects of this nature would also be present at the dredge cutterhead. Although sediments from the bayou portion of the project have been shown to contain varying levels of contaminants, these sediments do not produce unacceptable toxic impacts to marine organisms.

The disposal of new work and maintenance materials within open water sites in Mississippi Sound would result in short term increases in turbidity and nutrients and decreases in dissolved oxygen. These impacts would be localized to the vicinity of the disposal areas and would be rapidly dissipated with increasing distance from the discharge point. The increases in turbidity expected are well within the natural range of turbidity experienced in the Mississippi Sound area. Similar impacts would be expected to occur within the vicinity of the dredge cutterhead. As indicated above no toxic impacts would result from the deposition of these materials. The disposal in open water areas greater than 12 feet deep on the western side of the Mississippi Sound channel and south of the GIWW channel have been evaluated following the Sec 404(b)(1) Guidelines and this evaluation is included in Appendix D to the Main Report. State water quality certification, under Section 401 of the Clean Water Act, will be obtained prior to any discharge of dredged material in open waters of Mississippi Sound.

Disposal of materials in the Mobile North or Pascagoula ODMDS would probably not result in significant impacts to water quality. Short term increases in turbidity and nutrient levels would be expected to occur in the vicinity of the dump zone. Decreases in near bottom dissolved oxygen levels would probably occur in this zone as well. Due to the depths within these sites mounding is not expected to pose a problem.

Improvements to the channel as proposed in alternatives I - IX could result in a wedge of salt water moving landward in the channel and possibly impacting groundwater resources. Implementation of any of alternatives X - XVIII would not be expected to have this impact since a direct channel into the higher salinity waters of the Gulf of Mexico would not be constructed.

5.7 **Circulation.** Circulation patterns in the area are controlled primarily by astronomical tides. Under the "No Action" alternative changes in circulation of the nearshore region could occur with continued use of open water disposal sites 7, 8, or 9 (Figure EIS-1).

Dredging within the bayou would have no impact on circulation. Deepening and widening the channels within Mississippi Sound could cause slight changes in velocities within the channels themselves but these changes are not considered significant. Provision of a channel through Petit Bois Pass in alternative plans I - IX could have a significant effect on circulation structure within the pass. Additional studies would be required to determine the magnitude of these impacts.

Direct placement of new work material adjacent to the Mississippi Sound Channel segment, as proposed in alternatives I, II, IV, V, VI, VIII, X, XI, XIII, XV, XVI, and XVIII could cause localized impacts on circulation. Evidence of this type impact has been observed at Pascagoula, Mississippi, where new work material mounded and consolidated causing shallowing of the bottoms. Since disposal is planned for areas greater than 12 feet in depth, areas which are remote from the mainland shoreline, these impacts should not cause significant changes in existing circulation patterns.

Disposal of maintenance materials within Mississippi Sound as proposed in all the alternatives would have no significant impact on circulation. Studies done during the Mississippi Sound and Adjacent Areas Study (USACE, 1984) indicate that circulation is predominately toward the west in this area therefore all disposal areas have been located west of the Mississippi Sound Channel segment and Petit Bois Pass Channel segment.

Disposal of new work material from the Mississippi Sound Channel segment or the GIWW Channel segment or new work and maintenance material from the Petit Bois Pass Channel segment in either the Mobile North or Pascagoula ODMDS would have no impact on circulation of the nearshore Gulf of Mexico.

5.8 **Sediment Quality**. Clay sediments, similar to those present in the Bayou La Batre study area, have a high capacity for retaining pollutants discharged into the water column. Removal of these sediments and their bound contaminants during dredging would improve the sediment quality, especially within the bayou proper. This enhancement occurs under the "No Action" alternative and would continue with implementation of any of the alternative plans. Although contaminants have been shown to be present in the sediments of Bayou La Batre, the potential for toxic effects to marine organisms or bioaccumulation within these organisms is low.

All of the alternatives considered in detail would result in a large quantity of both new work and maintenance material from the bayou proper being placed in upland disposal areas.

Gulf disposal of materials in alternative plans IX and XIV would have no effect on the resources of the ODMDS.

5.9 **Groundwater Resources**. Under the "No Action" alternative groundwater resources in the area would continue to be highly variable. Some increase in demand would be expected as seafood processors continue and expand the practice of trucking shrimp from other states to their houses for processing. The lands adjacent to the bayou are already highly developed and undeveloped areas are in short supply. Future development of these areas for water dependent industry, therefore, would be expected to occur with or without the project.

Improvements to the channel as proposed in alternatives I -IX could result in a wedge of salt water moving landward in the channel and possibly impacting groundwater resources. Implementation of any of alternatives X - XVIII would not be expected to have this impact since a direct channel into the higher salinity waters of the Gulf of Mexico would not be constructed. Increased efficiency at existing seafood processors would occur, however, increased use of the resource is expected without the project since the seafood processors currently truck additional shrimp to their facilities for processing.

5.10 **Land Resource and Use**. All plans could induce further growth in the Bayou La Batre area. Currently undeveloped wetland areas adjacent to the bayou could be impacted by water dependent development induced by the improved project. Approximately 6.8 acres of wetlands along the east bank below Station 108+00; 0.4 acre of wetlands along the west bank above

Station 106+75, including Snake Bayou; and 5.9 and 7.0 acres of wetlands and shallow water bottoms, respectively, on the west bank below Station 106+75 are expected to come under development within the life of the project (See Figure 10, Main Report). Development of these areas, either through dredging or filling, would require individual Department of the Army permits. Mitigation for the impacts associated with filling these wetlands would be determined on a case-by-case basis at the time of application. Other wetland areas along the bayou have been exempted from development consideration at this time. These areas are typically pristine in nature; some are remote from the bayou and therefore not suitable for water dependent industry; and some serve as natural drainage ways. Future development of these areas would be based on the need for the proposed development as well as the lack of practicable alternatives sites.

Implementation of plans I, V, X, or XV would tend to alleviate the erosion of the Point aux Pins area. This area, which has been shown to have an erosion rate of approximately 6.7 feet per year contains extensive wetland and submersed vegetative resources.

Implementation of plans II, VI, XI, or XVI and III, VII, XII, or XVII would tend to alleviate the erosion of the eastern shoreline of Isle aux Herbes. Plans II, VI, XI, or XVI would provide protection to approximately 4,500 feet of shoreline while plans III, VII, XII, or XVII would provide protection to approximately 9,500 feet of shoreline. Like the Point aux Pins area, Isle aux Herbes contains extensive wetland resources which are currently being eroded by natural forces.

Implementation of plans I through IX would provide a sediment source to the eastern end of Petit Bois Island, however provision of the channel through Petit Bois Pass in these same plans could disrupt the natural littoral drift of sediments from Dauphin Island to the east. In addition, Petit Bois Pass is located within the Dauphin Islands Coastal Barrier Resources System Unit. Provision of a channel through this area is in conflict with the management activities of the Coastal Barrier Resources Act and additional coordination would be required prior to any construction in this area.

5.11 **Demography**. None of the plans considered in detail would have a significant impact on the demographic characteristics of the area.

5.12 **Economy**. Under the "No Action" alternative the economy would be expected to fluctuate in response to factors affecting the commercial fishing industry, shipbuilding, and the oil industry. Since the economy of Bayou La Batre is almost totally dependent upon fishing and shipbuilding implementation of any of the alternative plans would enhance the economic outlook for the area.

5.13 **Community Cohesion**. None of the plans considered in detail would have an effect on community cohesion.

5.14 **Recreational Opportunities**. Under the "No Action" alternative recreational opportunities would continue to be available. Implementation of any of the proposed plans would not impact recreational opportunities.

5.15 **Noise.** For the "No Action" alternative the existing noise levels in the project area would remain the same. Construction and maintenance of any of the alternative plans considered in detail would cause elevated background noise levels due to the equipment used. The elevated noise levels would be of a temporary nature and since much of the area is highly developed in nature or removed from inhabited areas the elevated noise levels should not be significant. There would be no long-term noise impact on wildlife.

5.16 **Aesthetics.** Under the "No Action" alternative the aesthetics of the area would remain in a similar condition to that existing currently. The presence of the dredge and attendant equipment would continue to cause a temporary degradation in aesthetics during each 3 year maintenance cycle. Implementation of any of the alternative plans would have similar impacts to the "No Action" alternative and would tend to enhance aesthetics in the immediate area of the bayou due to the requirement of bulkhead replacement for those currently in dilapidated condition. Use of the new disposal area would change that area from pine forest to disposal area, however with proper management of the facility the area can be aesthetically neutral.

5.17 **Transportation.** Under the "No Action" alternative transportation into Bayou La Batre would continue to be restricted by the 12-foot channel. Implementation of any of the alternatives would greatly enhance waterborne transportation into the port. Other transportation facilities would not be adversely affected by any of the plans.

5.18 **Public Facilities and Services.** Public facilities and services in Bayou La Batre would not be adversely affected by any of the plans considered in detail.

5.19 **Cultural Resources.** As stated in paragraph 4.2.19, the new proposed upland disposal site was inspected for cultural resources in September 1988. No archeological sites or historic structures were identified within the area. The Alabama State Historic Preservation Officer has concurred that the use of the proposed upland site would have no effect to cultural resources within this area. Implementation of any of the alternative plans would have no effect on submerged cultural resources in Alabama and Mississippi (See Appendix D, Section 8).

6.0 **Summary of mitigation measures.** Throughout the planning for the navigation improvements for Bayou La Batre, efforts have been made to incorporate "mitigation" into the project. As defined in the CEQ's Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (NEPA), "mitigation" includes: (a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; (e) compensating for the impact by replacing or providing substitute resources or environments (40 CFR 1500-1508). Paragraph 6.1 summarizes measures which have been incorporated into the design of the project to enhance the environment or minimize impacts.

6.1 As a result of past coordination efforts with the Federal and state environmental agencies in which they stressed the importance of shallow estuarine bottoms to the productivity of the estuarine system, serious consideration was given to restricting open water disposal to waters greater than 12 feet in depth. This is supported by studies performed during the Mississippi Sound and Adjacent Areas Study (USACE 1984) and past disposal operations at other projects. Areas characterized by depths of less than 12 feet are highly productive in nature and in the vicinity of Bayou La Batre are extensively used by fish and shellfish as nursery and feeding areas. Studies have also shown that the placement of new work material in shallow waters results in mounding which subsequently causes changes in circulation and water quality.

In addition plans were developed which maximized the use of upland disposal areas for both new work and maintenance materials. These plans call for the use of intensive management techniques to increase the life of the upland disposal areas while at the same time minimizing the acreage required.

Beneficial use of the new work dredged material was also considered a high priority during the formulation process. Although limited in quantity compared to maintenance materials the construction material has characteristics which would allow mounding in terms of berm construction or ease of containment for wetland creation.

6.2 As a result of these efforts impacts to significant resources due to the recommended plan have been minimized through proper environmental planning. Remaining impacts have been determined to be negligible therefore no mitigation is proposed.

7.0 List of Preparers

Name	**Expertise**	**Experience**	**Role in FEIS Preparation**
G. Ashford	Engineering, Environmental	5 years, Compliance Mobile District District	Environmental Compliance Manager
D. Gibbens	Archeology	10 years, Cultural Resource Mgmt. Mobile District	Effects on Cultural Resources
K. Graham	Landscape Architect	16 years, Study Management, Mobile District	Study Manager, Formulation of Alternatives
W. Mears	Engineering, Civil	10 years, Planning Engineering, Operations, Mobile District	Formulation of Alternatives
D. Nester	Biology	10 years, EIS Studies, Mobile District	Effects on Water Quality
S. Ivester Rees	Oceanography	6 years, Assistant Professor, Univ. Alabama, 7 years EIS Studies, Mobile District	EIS Coordinator

8.0 Public Involvement

8.1 Public Involvement Program. A history of public involvement is discussed in the Main Report and in Appendix A to the Main Report.

8.2 Required Coordination. Coordination for this study began in February 1984. Principal Federal agencies with which coordination has been conducted include the Fish and Wildlife Service, National Marine Fisheries Service, Gulf of Mexico Fishery Management Council, Gulf Islands National Seashore (National Park Service) and Environmental Protection Agency. At the State level coordination has been through the Alabama State Historic Preservation Officer, Alabama Department of Conservation and Natural Resources, Division of Marine Resources and Alabama Department of Environmental Management. Additional coordination is required with the State of Mississippi Department of Wildlife Conservation, Bureau of Marine Resources, Mississippi Department of Natural Resources, Bureau of Pollution Control, and Mississippi State Historic Preservation Officer.

8.3 Statement Recipients. This FEIS is being sent to the following:

Governor Guy Hunt
Senator Howell Heflin
Senator Richard Shelby
Representative H. L. 'Sonny' Callahan

Governor Ray Mabius

Advisory Council on Historic Preservation
Federal Highway Administration
Food and Drug Administration
Heritage Conservation and Recreation Service
Department of Interior
  Fish and Wildlife Service
  National Park Service
Department of Commerce
  National Marine Fisheries Service
Department of Transportation
  Coast Guard
Department of Health and Human Services
Department of Energy
Department of Housing and Urban Development
Soil Conservation Service
Environmental Protection Agency
Federal Maritime Commission
Federal Highway Administration
Federal Aviation Administration
Federal Railroad Administration
Federal Emergency Management Administration
Forest Service

Alabama-Mississippi Sea Grant Consortium

Alabama Department of Environmental Management
Alabama Department of Conservation and Natural Resources
Alabama Department of Economic and Community Affairs
Alabama State Conservationist
Alabama Forestry Commission
Alabama State Historic Preservation Officer
Geological Survey of Alabama
Dauphin Island Sea Lab

Mississippi Department of Natural Resources
Mississippi Department of Wildlife Conservation
Mississippi Department of Archives and History
State Conservation Service
Gulf Coast Research Laboratory

Public Interests

8.4 The major comments received on the DEIS are concerned with the following topics:

Detailed design of the disposal plan for the proposed Isle aux Herbes disposal area.

Long-term impacts associated with open water disposal.

Possible conflict with the long-term management plan for the Bayou Coden channel.

The non-selection of Isle aux Herbes Option B as the tentatively selected plan.

Development of currently undeveloped areas adjacent to Bayou La Batre.

All comments have been appropriately responded to and necessary changes have been made to the text of the EIS as specifically indicated in the Public Views and Responses Section (paragraph 8.5).

8.5 Public Views and Responses. A total of eleven letters of comment were received concerning the DEIS. Copies of these letters follow. Comments were received from the following:

	FEIS Page Number of Letter
U. S. Department of the Interior	281
U. S. Environmental Protection Agency	287
U. S. Department of Commerce National Ocean Survey National Oceanic and Atmospheric Administration	290
U. S. Department of Health and Human Services, Public Health Service, Centers for Disease Control	298
U. S. Department of Housing and Urban Development	300
U. S. Department of Transportation, Federal Highway Administration	302
Alabama Department of Environmental Management	304
Alabama Department of Economic and Community Affairs	307
Alabama Historical Commission	310
State of Alabama Highway Department	312
South Alabama Regional Planning Commission	315

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
RICHARD B. RUSSELL FEDERAL BUILDING, SUITE 1320
75 SPRING STREET, S.W.
ATLANTA, GEORGIA 30303

SEP 2 1988

ER-88/679

Colonel Larry Bonine
District Engineer
U,S, Army Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Bonine:

We have reviewed the Draft Environmental Statement and Feasibility Report for Navigation Improvement at Bayou La Batre, Mobile County, Alabama, and have the following comments,

General Comments

The Draft Environmental Impact Statement (EIS) and Feasibility Report provide a satisfactory discussion of the fish and wildlife resources within the project area and, except for a few points, the expected impacts of the various proposed alternatives, However, we have concerns regarding the chosen dredged material disposal option,

In March of 1988, the Daphne, Alabama, Fish and Wildlife Service (Service) Field Office, forwarded to the Corps of Engineers a draft Fish and Wildlife Coordination Act report addressing the proposed impact area and project alternatives, The Service also related concerns that the disposal of dredged material should be conducted in a manner that minimizes impacts to fish and wildlife resources and encouraged investigation into the possibility of utilizing the dredged material to benefit fish and wildlife resources, 1

Specific Comments

Page 90, Part F; paragraph 1 - There should be a discussion of the possibility of dredged material directly covering the marsh, A buffer zone has been considered and should be described in this section, Elsewhere in the EIS (Fig, 5 and 6), it appears that the dike would meet the island at both ends which would defeat plans for tidal flushing of the area, Additionally, a discussion should be included of potential impacts to the marsh if the Bayou Coden maintenance material and marsh-establishment efforts are completed prior to improvement of the Bayou La Batre channel, 2

Page 90, Part F; paragraph 2 - The chance of significant intertidal flow within the diked area would be minimal if the dike meets the existing marsh at both ends, The dike should be opened at the south end to provide tidal influx, 3

4 Page 90, Part F; paragraph 5 - It should be recognized that long-term impacts to benthic invertebrates would occur, Though the area of disposal would recolonize to a certain extent within 18 months, every 3 years periodic maintenance dredging would redisturb 500 acres of the 600 acres of waterbottoms that would be covered; i,e,, for only 12 months of every 3 years would the benthic population be stable, Consequently, it would be at least 50 years before the benthic population of the waterbottom would be able to return to preproject conditions,

5 It should also be noted that the referenced studies were conducted on maintenance material and may not be applicable to new work dredged material,

6 Pages EIS-49 and EIS-50 - Figures EIS-5 and EIS-6 illustrate proposed deposition areas along Coffee Island; however, the figures show fill occurring at the tidal gut that bisects Coffee Island and at the marsh where the dike would meet the island, These impacts are not described in the text,

7 Page EIS-36; paragraphs 5,9 and 5,10 - These two sections are contradictory in that paragraph 5,9 states that channel improvements would not induce additional development along the bayou; yet, paragraph 5,10 discusses the wetland areas that would likely be subject to development if the channel is improved, We believe that channel improvement could induce development of all of the remaining wetland areas along Bayou La Batre; including the 20,1 acres identified in the EIS and the wetland acreage exempted from consideration,

8 Fish and Wildlife Coordination Act Comments

The draft documents estimate that at least 20,1 acres of wetlands adjacent to Bayou La Batre could be developed as a result of the proposed channel improvements, These actions would have to be authorized via the Corps' Section 10/404 regulatory program, The Service, as well as other natural resource management agencies, would review each proposed development action and base our recommendations on the significance of the proposal's expected impacts to fish and wildlife and compliance of the work with various Federal statutes including the Endangered Species Act and the Section 404(b)(1) guidelines of the Clean Water Act, Where the least damaging practicable project alternative would involve unavoidable fish and wildlife impacts, denial of the permit or inclusion of adequate and appropriate compensation measures in the permit conditions might be recommended,

Summary Comments

9 The Service has coordinated with the Corps throughout the planning process, Potential project impacts have been significantly reduced through coordination and the resultant consideration of fish and wildlife resources of the Bayou La Batre area, There are, however, additional measures that should be incorporated into project plans to further reduce impacts to fish and wildlife resources, In general, dredging should be scheduled to occur

during late October to February to minimize impacts to spawning fish and shellfish, The project alternative offering the most promise is Plan XII which involves placement of the entire 2 million cubic yards of new work material along the east side of Coffee Island, Our position is based on information that indicates the marshes of Coffee Island have been and are continuing to erode at a significant rate, and that the new work material would be suitable for constructing a protective berm, Additionally, we do not expect that the opportunity to use such quality material will be available in the future, Plan XII, however, needs substantially more definition and refinement, We are concerned that no fill occur in the tidal inlets or the marsh, Also, the proposed dike should not meet the island on its south end so that the disposal area would be intertidal, Furthermore, the potential conflict between disposal or dredged material from maintenance of the Bayou Coden channel and dredged material from the Bayou La Batre channel improvements should be discussed and resolved in the final project documents, Further coordination regarding these issues is necessary, To facilitate such discussions, contact the Field Supervisor of the Fish and Wildlife Service, Daphne Field Office, P,O, Drawer 1190, Daphne, Alabama 36526 or telephone 205/690-2181, 9

Thank you for the opportunity to comment on these reports,

Sincerely yours,

James H. Lee

James H, Lee
Regional Environmental Officer

Response to U. S. Department of the Interior, Regional Environmental Officer

1. Comment noted. We appreciate the effort expended by the Daphne Field Office of the Fish and Wildlife Service in helping us meet our schedules relative to this project. We also greatly appreciate the cooperative manner in which they have approached the planning of an environmentally acceptable plan for improving the Bayou La Batre navigation project.

2. Comment noted. The description of the tentatively selected plan (See Section 3.2.3.3 of the DEIS, page EIS-16) indicated that a single row of hay bales would be placed just of the seaward existing shoreline of Isle aux Herbes. This barrier would provide protection to the existing wetland areas of the island from dredged material and/or related mud flows. A detailed design for the hay bale containment feature will be produced during the Preconstruction Engineering and Design (PED) phase of this project. We will continue to coordinate these aspects with the Fish and Wildlife Service (FWS) during PED to ensure the Service's concerns are alleviated.

We agree that from Figures EIS-5 and EIS-6 it appears that the dike would join the island at both ends. These figures were for the purpose of illustrating the general concept being proposed. The actual construction however, would not result in a diked containment area as is illustrated on the figures. As described in Sections 3.2.3.3 and 3.2.3.4 of the DEIS and as shown on the 'Section A-A'' inserts on Figures EIS-5 and EIS-6, a swale would remain between the existing shoreline and the crest of the berm. After construction this area would be subject to tidal flushing and any tidal creeks emptying on the east side of the island in this area would retain their natural characteristics. These details will be coordinated with the FWS and other Federal and state agencies during PED.

Planning associated with Isle aux Herbes Options A and B was done with full cognizance of the proposed plans for long-term maintenance at Bayou Coden and in fact was the result of discussions with the interagency team involved with the Bayou Coden effort. A statement has been added to FEIS Sections 3.2.3.3 and 3.2.3.4 to address this concern and to indicate that the detailed design during PED will take into account any change in the area due to Bayou Coden activities. In addition, a statement has been added to Section 5.1 of the FEIS to indicate that the implementation of the Isle aux Herbes disposal will not conflict with any ongoing Bayou Coden activities and therefore result in no adverse impact to the marsh establishment efforts.

3. See response to your comment numbered 2.

4. Comment noted. Studies have shown that benthic systems are able to recover from pertubations such as dredged material disposal within from as little as 6 weeks to as much as 18 months. This recovery period is highly dependent upon the level of disturbance, time of disturbance, and most importantly the type of benthic community being disturbed. In addition, during the period of recovery, the productivity from an area is still

available to the estuarine system and the level of productivity from an area may shift during this recovery period. After disuturbance of an area, early stage succession typically begins within a few days with the arrival of swimming crustaceans (i.e., amphipods and cumaceans) and more motile polychaetes and echinoderms (i.e., nereids and nephtyids and large ophiuroids) which immigrate into the disturbed area as adults from adjacent areas. More importantly however, the larvae of relatively opportunistic polychaetes and bivalve molluscs settle onto the new substratum from the overlying water column. These opportunistic species (Group I colonizers, McCall 1978) are characterized by short generation times, small size, high fecundity, and high larval availability. These species most commonly experience high mortality and may disappear as a result of competition and/or predation from the more motile immigrants. Later phases of succession are usually characterized by the gradual reestablishment of Group III species which are represented by the less mobile crustaceans, molluscs, and less opportunistic polychaetes. These species, in contrast to Group I colonizers, maintain more or less constant, relatively low population densities, are usually larger in size and exhibit lower fecundity and recruitment potential. Group II colonizers are intermediate in their life strategies.

Information collected during the Mississippi Sound and Adjacent Areas Study (Vittor and Associates 1982) indicates that in the areas generally considered for open water disposal of dredged material only Group I and II colonizers are present. Based on this information recovery in the areas in question would be relatively rapid and that the overall impact to the benthic system would be short-term and that the disposal of dredged materials on a three year cycle at these areas would not result in significant impacts to the estuarine system. This information has been added to Section 5.2 of the FEIS to address your concern.

5. Comment noted. The thin-layer monitoring program at Gulfport, Mississippi, referred to in the DEIS, was conducted utilizing 50,000 cubic yards of new work or virgin material. The results of this study would be indirectly applicable to determining the impacts of the recommended plan on benthic and fishery resources.

6. See response to your comment numbered 2.

7. As indicated in Section V.F. on page 91 of the main report and Section 5.10 of the DEIS (page EIS-28) currently undeveloped wetland areas adjacent to the bayou could be impacted by water dependent development induced by the improved project. This has been revised to indicate that these areas are likely to be considered for development with or without the proposed project. As described in Section III.C. of the Draft Feasibility Report (page 62), this assumption is based on the fact that suitable areas for additional water dependent activities at BLB are in short supply. This assumption is supported by _______ permit and ________ pre-application for ______ of the acreages described.

Those impacts associated with actions required of the local sponsor as part of the LCA; i.e., repair or replacement of existing bulkheads and provision of bulkheads for property protection, have been addressed in the overall impact assessment for the proposed project. Additionally, the upland disposal areas have been planned to contain material originating from deepening of berthing areas by those facilities along the bayou which directly benefit from the proposed project as well as material which may be removed from other berthing areas during the life of the project.

The District believes it likely that future development of the 20.1 acres of wetlands identified in the DEIS will occur, but agrees that this development would have to be separately authorized via the Corps' permit program. The requirement for wetland compensation in permitting this development will be addressed through the permit/public notice coordination process.

Section 5.9 of the FEIS has been revised to remove any apparent contradiction.

8. See response to your comment numbered 7.

9. Comment noted. We agree that project impacts have been significantly reduced through planning and coordination efforts.

In an effort to take advantage of natural low water level conditions in Mississippi Sound and to minimize the impact to species utilizing the wetlands of Isle aux Herbes as spawning areas, every effort will be taken to schedule the disposal at Isle aux Herbes between November and March. Sections 3.2.3.3 and 3.2.3.4 of the FEIS have been revised to reflect this. The construction dredging activities of the rest of the project and maintenance operations associated with the channel would have no impact on spawning activities since the areas associated with these operations are not in or adjacent to known spawning areas.

Plan XII has been designated as the Environmental Quality (EQ) Plan. We agree that the use of construction dredged material at Isle aux Herbes will be of benefit to the wetlands in that area and will, during the development of more detailed engineering studies for the project, investigate the potential for placement of additional material in that location. Should it be found that greater quantities of material can be placed at Isle aux Herbes without increasing the construction costs for the project, this provision will be made a part of project construction. There is ample provision, however, in both law and policy for a local or State Goverment to pay the difference in the increased cost of dredging or material disposal if a use for the material other than the least-cost disposal is desired. This is a matter than can be worked out during the PED phase of the project. Coordination on this matter will be continued during this phase in an effort to realize all the environmental benefits associated with the new work material.

Please refer to responses to your comments numbered 2 for additional information.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET
ATLANTA, GEORGIA 30365

AUG 22 1988

4PM-EA/GJM

Mr. Hugh A. McClellan, Acting Chief
Environment and Resources Branch
ATTN: Coastal Environment Section
U.S. Army Corps of Engineers, Mobile
P.O. Box 2288
Mobile, Alabama 36628-0001

SUBJECT: Draft Environmental Impact Statement for Navigation Improvements at Bayou La Batre (Mobile County), Alabama
EPA LOG NO.: D-COE-E32068-AL

Dear Mr. McClellan:

Pursuant to Section 309 of the Clean Air Act and Section 102(2)(c) of the National Environmental Policy Act, EPA, Region IV has reviewed the subject document. EPA technical staff have had a relatively long and comprehensive previous involvement with this project during the feasibility phase to include performing toxicity and bioaccumulation tests on the sediments in the navigation channel. In addition to these tests and extensive discussions with our review staff, two onsite inspections were made. This onsite experience, especially the boat trip you provided to the Isle of Herbes, was valuable in that it provided us with a more precise determination of the physical elements of the proposal than otherwise would have been the case. In general, the design elements of the tentatively selected alternative and the array of options noted in the document tracked the discussions we had during the coordination meetings on the project. 1

In addition to upgrading the navigational capacities of Bayou La Batre the proposed channel deepening will provide a source of "new-work" material which could be used to provide some temporary relief to the erosion of the wetlands on adjacent shoreline/nearshore features. Exactly how and where this material will be placed remains a matter of debate among the involved principals of the various agencies. From our perspective Concept B (EIS-50) which makes maximum use of this dredged material to protect the eroding shoreline of Isle Aux Herbes merits re-examination. The opportunity to secure this volume of proximate, suitable material to protect this barrier feature and its accompanying marsh is unlikely to occur again in the foreseeable future. 2

The cost/benefit ratio of the tentatively selected alternative and Option XII are relatively close, 2.19 vs 2.12 respectively, under the current criteria. However, if the value to the environment of protecting the marsh and providing some degree of storm surge protection to the Bayou La Batre and Bayou Coden development were factored into the equation, Concept B might well become the NED plan. In our opinion the value of the marsh and storm surge protection aspects should be inserted into the calculations to arrive at a more complete assessment of the overall impacts of the project. 3

4 It has been mentioned that the loss of shallow bottoms to the increased deposition of Concept B would be a negative environmental factor. However, given the shifting nature of the subject sandy bottoms, the research literature suggests the biological perturbation should be within acceptable limits. Export of detrital material from and interface of the marsh with the marine environment would be somewhat more limited by a complete berm alignment, but the western margin of the island remains unobstructed and should be competent to maintain satisfactory interaction. Further, the area in question appears to have been until quite recently an emergent part of the island. Unless it can be demonstrated in some fashion that the sacrifice of this type of shallow habitat materially limits productivity in the area, we believe the action to protect the entire marsh community on the island rather than just a part of same makes good sense. The mitigation for the total project is currently being coordinated by the principals and should compensate for any other unavoidable losses.

5 The placement of dredged material in the Point aux Pins/Isle aux Dames area has prompted interest among your staff to lessen shoreline erosion. However, certain resource agencies and local academics have expressed reservations to this proposal since there are vascular "seagrass" beds in the immediate area. These taxa could be adversely impacted by immediate inundation or drift of dredged material during or after construction. However, if this area continues to erode and wave energy results in increased erosion, what will happen to the "grass" beds? It appears that these taxa are colonizing an area once vegetated by emergent marsh. However, if the sheltering effect of the Point is lost, would these "beds" be adversely affected? A case could be made for any number of eventual scenarios. It seems that the risks and benefits of this option should be examined in greater detail before a reasoned decision can be made to accept or reject this alternative.

6 Alternative methods to handle process water from the seafood houses are being developed so effluent discharges will not continue to violate water quality standards. Since increased fishery's processing is one of the stated goals of this channel upgrade, elevated BOD loadings are a given. Therefore, we would like to see some definitive results on the efficacy of the new treatment facilities, e.g., sludge drying beds, before additional processors become operational.

7 In a related matter it was clearly noted in the DEIS that future development is likely to occur in wetlands within the port environs. We wish to go on record now as indicating that each of these proposed developments will be viewed on their individual environmental merits and not as an integral, necessary part of this project. Further, any unavoidable losses from the former will have to be functionally compensated prior to any fill via Section 404 action.

8 On the basis of our evaluation a rating of EC-2 was assigned. That is, we are concerned that an opportunity will be lost to positively impact the environment if full use is not made of this new work material to retard the erosion currently being experienced in the project area. In fact, we have pronounced environmental reservations (ER) to unnecessarily placing this material in deep open water given the obvious need for the material in the nearshore zone, the potential that its loss would have on exacerbating erosion there, and biological losses that occur from dredge spoil deposition even when the "thin-layer" technique is used. Regardless, of which option is ultimately selected some additional information will have to be developed for the final document.

Should you have any questions concerning our comments, or if we can be of any further assistance, please do not hesitate to contact Dr. Gerald J. Miller at 404 347-5014.

Sincerely yours,

Heinz Mueller

Heinz J. Mueller, Acting Chief
NEPA Review Staff
Environmental Assessment Branch

Response to U. S. Environmental Protection Agency, Region IV

1. Comment noted. We appreciate the efforts expended by Region IV of the Environmental Protection Agency during the planning and coordination of this project.

2. Refer to response to comment numbered 9 in Department of Interior letter dated September 2, 1988.

3. Traditionally, an economic value for marsh or other environmental features have not been established and, therefore, not utilized in the economic analysis for this project. Until agreement is reached relative to such values, we cannot address issues such as you raise except in a qualitative fashion. The potential storm surge protection offered by the placement of construction dredged materail at Isle aux Herbes would be minimal. The average elevation of Isle aux Herbes, even with the proposed placement, is approximately 3 feet NGVD. The results from the Sea, Lake, and Overland Surges from Hurricanes (SLOSH) model for the Mobile Bay basin indicate that the potential for overtopping of the island even in a minimal hurricane, thereby negating any potential for surge protection. We agree that the use of construction dredged material at Isle aux Herbes will be of benefit to the wetlands in that area and will, during the development of more detailed engineering studies for the project, investigate the potential for placement of additional material in that location. Should it be found that greater quantities of material can be placed at Isle aux Herbes without increasing the construction costs for the project, this provision will be made a part of project construction. There is ample provision, however, in both law and policy for a local or State Goverment to pay the difference in the increased cost of dredging or material disposal if a use for the material other than the least-cost disposal is desired.

4. Comment noted. We agree that the benefits associated with the provision of erosion protection to the wetlands of Isle aux Herbes greatly outweigh the impacts associated with the filing of the shallow bottoms associated with the proposed disposal area.

It has been determined that the potential project impacts have been significantly reduced through coordination and the resultant consideration of fish and wildlife resources in the Bayou La Batre area. Remaining impacts have been determined to be negligible therefore no mitigation is proposed.

5. Comment noted. Although we believe significant environmental benefits could be gained via the restoration of the Point aux Pins/Isle aux Dames shoreline, we are not able to quantify the benefits at this time. Without these additional benefits this alternative does not meet the requirements of the National Economic Development Plan. Should additional interest in this alternative be forth coming, we will be more than willing to do further studies during the PED phase of the project to investigate the risks and benefits as you suggest.

6. The total seafood processing infrastructure within Bayou La Batre is currently operating at about 50 percent capacity. The city recently completed the construction of a new $1.2 million wastewater outfall line to service the seafood processing facilities. This facility was designed to accommodate existing facilities with provision for additional facilities as well.

7. Refer to response to comment numbered 7 in Department of Interior letter dated September 2, 1988.

8. Comment noted. No response necessary.

UNITED STATES DEPARTMENT OF COMMERCE
The Chief Scientist
National Oceanic and Atmospheric Administration
Washington, D.C. 20230

August 29, 1988

Mr. Hugh A. McClellan
Department of the Army
Mobile District, Army Corps of Engineers
Mobile, Alabama 36628-0001

Dear Mr. McClellan:

This is in reference to your Draft Supplemental Environmental Impact Statement on the Navigation Improvements, Bayou La Batre, Alabama. Enclosed are comments from the National Oceanic and Atmospheric Administration.

We hope our comments will assist you. Thank you for giving us an opportunity to review the document.

Please note the change in our address for future environmental impact statements: 1

Director
Department of Commerce
NOAA/CS/EC/Room 6222
14th & Constitution Avenue, N.W.
Washington, D.C. 20230

Sincerely,

David Cottingham

David Cottingham
Ecology and Environmental
Conservation Office

Enclosure

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
OFFICE OF CHARTING AND GEODETIC SERVICES
ROCKVILLE, MARYLAND 20852

AUG 22 1988

MEMORANDUM FOR: David Cottingham
Ecology and Environmental Conservation Office
Office of the Chief Scientist

FROM: Rear Admiral Wesley V. Hull, NOAA
Director, Charting and Geodetic Services

SUBJECT: DEIS 8807.09 - Navigation Improvements, Bayou La Batre, Alabama

2

The subject statement has been reviewed within the areas of Charting and Geodetic Services' (C&GS) responsibility and expertise. Since safety of navigation is one of C&GS' primary missions, this proposal was examined with that in mind and any other impact it may have on C&GS' activities and projects.

The proposed deepening and extensions of the channels serving Bayou La Batre and the surrounding area are considered to be significant improvements. C&GS considers the establishment or improvement of navigation channels to be extremely important for the safe and efficient operation of vessels and welcomes any plans to accomplish this purpose.

The project area is covered on NOS nautical chart 11374 and, to a lesser extent, on chart 11373. Any changes affecting navigation as a result of this proposed project would be reflected on the chart. If appropriate, the information would be disseminated through chartlets or Notice to Mariners, or both.

In addition, a review of C&GS records has indicated that there are no geodetic control monuments in the immediate vicinity of the proposed project. Should there be need for information about geodetic control monuments in adjacent areas, please contact the National Geodetic Information Branch, N/CG17, Rockwall Bldg., room 20, National Geodetic Survey, NOAA, Rockville, Maryland 20852, telephone 301-443-8631

Should there be any need for further information about the navigation comments contained in this response, please contact the Chart Planning and Technology Group, N/CG22x2, WSC1, room 804, Nautical Charting Division, NOAA, Rockville, Maryland 20852, telephone 301-443-8742.

cc:
N/CG1x10/33 - Rindal
N/CG17 - Spencer
N/CG22x2 - Frey

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
9450 Koger Boulevard
St. Petersburg, FL 33702

August 23, 1988 F/SER1:AM

Colonel Larry S. Bonine
District Engineer, Mobile District
Department of the Army, Corps of Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Bonine:

The National Marine Fisheries Service (NMFS) has reviewed the Draft Environmental Impact Statement (DEIS) on Navigation Improvements At Bayou La Batre dated July 1988. The following comments are offered for your consideration.

General Comments:

The DEIS adequately describes fishery resources and wetland habitats within the study area. However, there are numerous assumptions that concern the NMFS because they are not supported by sound scientific data. 3

The Corps of Engineers (COE) assumes that the 20.1 acres of productive wetlands that would come under increased development pressures within the project area would be protected or compensated for under existing federal permit programs. Data compiled by NMFS regarding existing COE regulatory programs within the southeast contradict this assumption. Further, even when mitigation is incorporated into issued permits, it usually is not monitored for success. We are especially concerned that mitigation is mostly unsuccessful. Even when vegetation is established, preliminary NMFS research indicates that created marshes, even after many years, do not produce the type and amount of fishery resources produced by natural marshes. We would, therefore, recommend the COE more adequately address secondary impacts associated with channel improvements, and incorporate some means of protection or compensation for the wetlands within the overall project design. 4

Table VII on page 45 indicates that 73.6% of the Bayou La Batre resident fleet as well as 91% of the transient vessels using the harbor have a draft of 10 feet or less. The assumption conveyed on page 65, paragraph 4, is that since there is almost no land available along the bayou to accommodate new or induced commercial activity, that, "Economic growth, therefore, is in the gradual shift to larger, more efficient, commercial fishing vessels in order for Bayou La Batre to maintain its current market share within the Gulf of Mexico." A similar trend would be seen in the shipbuilding industry along the bayou. 5

5 The assumption is that a deeper channel alone would sustain the Bayou La Batre commercial fishery and shipbuilding operations. There is no discussion about the displacement of smaller vessels to other areas nor is there a discussion relative to the unit cost for one of the design vessels used to calculate channel dimensions. Cost estimates provided by two local shipbuilders capable of building a 100 net ton (192 feet long x 40 feet wide x 16 feet draft) vessel ranged from 2.5 to 4.0 million dollars depending on electronics and operational equipment. The COE should determine what percentage of the resident fleet that currently drafts less than 10 feet would be able to expend this kind of monetary resources to maintain a market share. Further, where will these shallow draft vessels relocate to and what impact will this relocation have on adjacent harbors?

6 The document states on page 66, paragraph 1, "...the needs of commercial enterprises at Bayou La Batre is a deeper and wider channel in order to maximize operational efficiency within the project." Since there is no economical means available to widen the channel within Bayou La Batre, the question remains how to maximize operational efficiency within the harbor. Deepening the channel to 18 feet + one foot advanced maintenance + one foot overdredge does nothing to increase dockage space or increase operational area within Bayou La Batre. If anything, the increase in numbers of larger vessels would adversely affect operational efficiency within Bayou La Batre due to crowding.

7 The inference that marsh will be created naturally on dredged material adjacent to Isle Aux Herbes is not supported by any data. The placement of dredged material adjacent to Isle Aux Herbes during the past (Bayou Coden maintenance dredging) three dredging cycles, and the failure of any substantial area to become vegetated naturally in a 6-year period, would negate any conclusions that marsh would become established on dredged material areas without intensive plantings of marsh species.

8 Further, we do not consider the building of a berm six feet high (three feet above mean low water), 10 feet wide at the crest, 1,000 feet wide at the base, and approximately 6,000 feet long to be a very good opportunity. The description indicates that the area will be completely diked, thereby eliminating tidal exchange, will isolate the marsh/open water interface adjacent the island, and will isolate tidal cuts in the island that provide additional interface between the marsh and fishery resources. Further, the swale between the berm and island is and will continue to be used on a 3-year cycle as a dredged material disposal area for maintenance material from the Bayou Coden navigation project. What is described is a diked disposal area adjacent Isle Aux Herbes with limited (one row of hay bales) protection from mud flows and spill over for black needlerush and smooth cordgrass wetlands on the island. We believe a more adequate description of what is intended for this area is needed in the final document.

The DEIS implies on page 90 that long-term impacts to benthic populations are not expected to occur from open-water dredged material disposal. This statement is based on studies that indicate repopulation occurs within 18 months under normal operations and within as little as six weeks following thin layer placement. We accept the numerous long-term studies that indicate an 18 month recovery period under normal conditions. This fact coupled with a 3-year dredging cycle results in recovery of benthic populations occurring 50% of the time over the life of the project. This would effectively remove these areas from productivity for 25 years. If one considers all the open-water disposal areas within Mississippi Sound the cumulative effect could become significant to benthic populations and higher trophic levels. 9

The reference to thin-layer disposal techniques, which appears to be the preferred means as indicated on page 87, has not been adequately shown to be less damaging. The two short-term studies accomplished to date have only provided minimal data and have not demonstrated long-term impacts. If the COE intends to utilize thin-layer disposal on future projects, we would strongly suggest that a long-term (one year pre-, two years post-dredging minimum) study of thin layer disposal be implemented as part of this project design. 10

Specific Comments:

Page 32, Figure 10 - This figure is difficult to interpret because of poor reproduction. 11

Page 33, Figure 11 - Same as figure 10. 12

Page 34, Figure 12 - Same as figures 10 and 11. 13

Page 89, Figure 19 - This figure depicts the wrong disposal configuration adjacent to Isle Aux Herbes and does not show the area of proposed marsh nourishment. 14

Page EIS-16, Section 3.2 3.3 - The acreage figures given for the thin layer disposal area do not correspond with the amount of material being dredged. For example, if 700,000 cubic yards of material are to be placed in an area to a depth of one foot then only 433 acres should be covered. The report indicates that 750 acres would be impacted. Further, the maintenance material 430,000 cubic yards should only cover 266 acres one foot deep rather than the 415 acres indicated. Are the increased acreage figures meant to imply that the boundaries for the disposal area used for thin layering cannot be accurately marked or is the COE trying to reduce the depth of disposal by increasing the area? 15

It also is interesting that 7.3 million cubic yards of material is expected to be dredged over the life of the project. This is enough material to cover 4,525 acres of Mississippi Sound one foot deep or the indicated 415 acres 10.9 feet deep. This assumes that the material remains within the disposal area over the life of the project. We doubt this will occur. In all probability a significant area of Mississippi Sound bottoms will be impacted by thin layer disposal. The major question is how significant is the impact and how large is the area of impact. Only long-term studies can answer these and other questions regarding thin-layer disposal within Mississippi Sound. 16

Sincerely yours,

Andreas Mager, Jr.
Acting Assistant Regional Director
Habitat Conservation Division

Response to U. S. Department of Commerce, Ecology and Environmental Conservation Office

1. Thank you for your comments. Our mailing list has been revised to reflect your change in address.

2. Thank you for your comments. No response is required.

3. Comment noted.

4. Refer to response to comment numbered 7 in Department of Interior letter dated September 2, 1988.

5. The vessel dimensions and costs noted in your comment are not those of a commercial fishing vessel but a large research vessel. The trend in the Gulf of Mexico commercial fishing fleet and the Bayou La Batre fleet is toward larger vessels, based on data received from the NMFS office in Bayou La Batre and field interviews, and that trend is expected to continue into the future. In addition, the number of vessels within the Bayou La Batre commercial fishing fleet has remained relatively stable. Therefore, we do not expect any displacement of smaller vessels to other ports from Bayou La Batre due to a deepened channel. However, over time and consistent with historic trends, some owners of commercial fishing vessels will replace their vessels with those of larger size. The financial data required to quantify the numbers and sizes of these replacement vessels and the times of replacement is not available. Historic trends were used to project future increases in operational inefficiencies associated with the existing channel in order to calculate economic benefits for a deepened channel. This trend is currently 1.91 percent annually and is expected to continue until the year 2001, at which time the maximum probable catch for shrimp within the Gulf of Mexico is expected to be reached.

6. It is not expected that the increase in vessel sizes for commercial fishing vessels and those constructed by the shipbuilding industry at Bayou La Batre will have significant impact to existing docking space within the bayou. The vessels constructed within the bayou are not docked for long periods of time but are sold and transported to other locations. Also, the vessels comprising the commercial fishing fleet come into the bayou at intervals to unload catch and to refuel and resupply. Consequently, all of the commercial fishing vessels are not competing for dock space within the bayou at the same time.

7. Comment noted. We fail to find any inference to the fact that marsh will be created naturally in dredged material adjacent to Isle aux Herbes. To the contrary, Section 5.1 of the DEIS (pages EIS 28-29) states that implementation of any one of several alternatives, included the tentatively selected plan, would provide some protection to the wetland habitats along the eastern shore of the island but that no additional emergent wetland habitat would be provided.

8. Refer to response to comment numbered 2 in Department of Interior letter dated September 2, 1988.

9. Refer to response to comment numbered 4 in Department of Interior letter dated September 2, 1988.

10. We disagree with the reviewers' comments relative to the impacts associated with thin-layer disposal. Two extensive studies of 54-week duration have been performed to assess the impacts of thin layer disposal on aquatic resources. One study, at Fowl River, Alabama, addressed the impacts associated with disposal of maintenance material. The other study, at Gulfport, Mississippi, addressed the impacts associated with disposal of new work or virgin material. The study plan for each of these studies was the result of interagency coordination and was designed to address short-term (less than one year) impacts. As such, data related to fishery and benthic resources were collected two weeks prior to the disposal operation and at 2-, 6-, 20-, and 52-week intervals following disposal. The results of these studies have been coordinated with the NMFS and other interested Federal and state agencies for their review and comment, and were summarized in Section 5.2, page EIS-30, of the draft report.

While these studies did not address long-term impacts (greater than one year) studies in areas which have historically been utilized for disposal of dredged material (reference Gulfport, MS) have not shown significant changes in aquatic resources. Please refer to response to comment numbered 4 in Department of Interior letter dated September 2, 1988 for additional information. This information, coupled with an understanding of the physical and biological nature of the proposed disposal areas (i.e., a system that is physically controlled) provides the basis of our statements relative to the severity of impacts associated with thin layer disposal.

The paragraph relative to the impacts of thin layer disposal of maintenance material (see Section 5.2, page EIS-31) has been revised to discuss this rationale.

11. Comment noted, Figure 10 has been reproduced in the Final Report.

12. Comment noted, Figure 11 has been reproduced in the Final Report.

13. Comment noted, Figure 12 has been reproduced in the Final Report.

14. Comment noted. Figure 19 has been revised in the Final Report to reflect Isle aux Herbes Disposal Option A. As described in Section 3.2.3.3 of the DEIS, the new work material would be utilized to create an emergent bar east of the Isle aux Herbes shoreline. Section 5.1 (page EIS-28 of the draft EIS) indicated that implementation of a number of alternatives, including the tentatively selected plan, would provide protection to the shoreline but would not provide additional emergent wetland habitat.

15. During the dredging process, water is added to the material being dredged such that the slurry volume, that volume of material reaching the floor of the disposal area, is greater than the in-situ volume of material

being dredged. This difference results in a bulking factor which is dependent primarily on the type of material being dredged; e.g., sandy material has a very low bulking factor while fine grained material may be one and one-half times or more. Our estimates presented in the DEIS assume a bulking factor of 1.8 which results in a very conservative estimate of total acreage which may be impacted.

16. Comment noted. We agree that the material placed in the open water disposal areas will be transported from these areas in time. As discussed in response to your comment 10, the Mississippi Sound is a physically dominated estuary. Wind-wave resuspension of bottom sediments, transport of sediment by currents, and the influx of sediments via freshwater inflows play a significant role in determining the overall biological structure of this estuary. Because of the physical nature of this estuary, organisms are adapted to movement of sediments as well as the highly turbid nature of the water. Based on this information, we believe the disposal of dredged material over the life of the proposed BLB project will result in impacts within the natural range of variability of the system and therefore will not result in significant long-term impacts to Mississippi Sound.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta GA 30333

September 6, 1988

Hugh A. McClellan
Acting Chief, Environment
and Resources Branch
Dept. of the Army
Mobile District, Corps of
Engineers
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Mr. McClellan:

Thank you for sending the Draft Supplemental Environmental Impact Statement (DEIS) for "Navigation improvements at Bayou La Batre, Alabama." We are responding on behalf of the U.S. Public Health Service. We have reviewed the document and have no comments to offer at this time.

Thank you for sending this document for our review. Please insure that we are included on your mailing list for further documents which are developed under the National Environmental Policy Act (NEPA).

Sincerely yours,

David E. Clapp, Ph.D., P.E.
Environmental Health Scientist
Special Programs Group
Center for Environmental Health
and Injury Control

Response to Department of Health and Human Services, Public Health Service, Centers for Disease Control

1. Comment noted. No response necessary.

U.S. Department of Housing and Urban Development
Atlanta Regional Office, Region IV
Richard B Russell Federal Building
75 Spring Street, S.W.
Atlanta, Georgia 30303-3388

August 11, 1988

Dr. Susan Ivester Rees
Coastal Environment Section
Department of the Army
Mobile District, Corps of Engineers
Post Office Box 2288
Mobile, AL 36628

Dear Dr. Rees:

This is in response to your letter dated July 18, 1988, transmitting the Draft Feasibility Report and Draft Environmental Impact Statement for navigation improvements at Bayou La Batre, Alabama.

Our review of the document indicates there would be no adverse impact upon any HUD programs as a result of this project.

Thank you for the opportunity to review and comment on the report.

Sincerely,

Ivar O. Iverson
Regional Environmental Officer

Response to U. S. Department of Housing and Urban Development, Region IV

1. Comment noted. No response necessary.

U.S. Department
of Transportation

**Federal Highway
Administration**

Alabama Division Office

441 High Street
Montgomery, Alabama 36104-[illegible]

July 25, 1988

IN REPLY REFER TO:

HEC-AL

Mr. Hugh A. McClellan
Acting Chief, Environment and
Resources Branch
Department of the Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628-0001

Dear Mr. McClellan:

Subject: Draft Feasibility Report and
Draft Environmental Impact Statement (DEIS)
for Navigation Improvements at Bayou La Batre,
Alabama

We have reviewed the subject Draft Feasibility Report and DEIS and have no comments to offer. We appreciate the opportunity to comment.

Sincerely yours,

for Joe D. Wilkerson
Division Administrator

Response to U. S. Department of Transportation, Federal Highway Administration

1. Comment noted. No response necessary.

ADEM

ALABAMA
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Guy Hunt
Governor

Leigh Pegues, Director

1751 Federal Drive
Montgomery, AL
36130
205/271-7700

Field Offices:

Unit 806, Building 8
225 Oxmoor Circle
Birmingham, AL
35209
205/942-6168

P.O. Box 953
Decatur, AL
35602
205/353-1713

2204 Perimeter Road
Mobile, AL
36615
205/479-2336

Colonel Larry S. Bonine, District Engineer
Mobile District Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628-0001

RE: Draft Feasibility Report and Environmental Impact
Statement for navigation improvements at
Bayou La Batre, Alabama.

Dear Colonel Bonine:

The Alabama Department of Environmental Management has reviewed the Draft Feasibility Report and EIS regarding Bayou La Batre navigation improvements. This agency will be requested to make a determination as to the project's consistency with the Alabama Coastal Area Management Program and state water quality law and regulations. The following comments are offered for your consideration: 1

A. Isle aux Herbes Disposal Site

1. The tentatively selected plan for disposal sites in Mississippi Sound is described and illustrated on page EIS-51 and includes disposal only at Isle aux Herbes' northeast sector. Figure 19 of the Main Report (p. 89) illustrates the disposal site as including the entire east side of Isle aux Herbes. An apparent discrepancy exists. 2

2. Detailed information regarding the size of the disposal area, capacity, anticipated height of disposed materials, conduciveness to revegetation, and fate of existing tidal channels on the east side of the island will need to be provided. 3

3. At the August 24, 1988 project public meeting, one commenter pointed out the existence of bottom leases and presence of oysters at or near the disposal area. Additional information regarding this potential problem should be provided. 4

4. Disposal of maintenance material dredged from the Bayou Coden federal project channel has been proposed at Isle aux Herbes. How will the disposal needs of both projects be accommodated and interfaced? 5

B. Open Water Disposal of Dredged Materials

In this agency's April 16, 1987 feasibility study comment letter, it was suggested that a quantitative assessment of the disposal area's productivity and impacts of open-water disposal be made. In the Draft Report submitted for our review, a qualitative analysis of anticipated impacts is provided. The EIS states that the disposal area will recolonize within 12-18 months. Considering the additional disposal of maintenance dredged material approximately every three years, what changes in species diversity and population can be anticipated when comparing pre-project and post-maintenance disposal area populations? 6

Thank you for this opportunity to provide our comments and concerns. Please contact me at your convenience if you have any questions.

Sincerely,

Bradley W. Gane
Environmental Scientist

Response to Alabama Department of Environmental Management

1. Comment noted. The determination has been made that the recommended plan is consistent with the Alabama Coastal Management Program to the maximum extent practicable. As required by Section 401 of the Clean Water Act of 1972, state water quality certification will be obtained prior to discharge of dredged materials into waters of the U. S. The 404(b)(1) Evaluation is included in Appendix D to the Main Report.

2. See response to comment numbered 14 in U. S. Department of Commerce letter dated August 29, 1988.

3. Information relative to size of the disposal area, capacity, and design of the proposed disposal area was provided in Section 3.2.3.3 of the DEIS. This information may also be found in this section of the FEIS. For additional information relative to fate of the existing tidal channels refer to response to comment numbered 2 in U. S. Department of Interior letter dated September 2, 1988. For information relative to revegetation refer to response to comment numbered 14 in U. S. Department of Commerce letter dated August 29, 1988.

4. Coordination with Mr. Hugh Swingle of the Alabama Department of Conservation and Natural Resources, Marine Resources Division, has been undertaken relative to the oyster shell planting activities that have been occurring along the eastern shore of Isle aux Herbes. Future planting of shells in this area will be restricted and provision has been made to have oyster resources present in this area removed prior to disposal. This has been agreed upon by Mr. Nelson, who was the commenter at the public meeting. This information has been included in Sections 4.2 and 5.2 of the FEIS.

5. Refer to response to comment numbered 1 in U. S. Department of Interior letter dated September 2, 1988.

6. Refer to response to comment numbered 4 in U. S. Department of Interior letter dated September 2, 1988.

Alabama Department of Economic And Community Affairs

GUY HUNT
GOVERNOR

FRED O. BRASWELL III
DIRECTOR

Spetember 8, 1988

TO: Mr. Hugh A. McClellan, Acting Chief
Environment and Resources Branch, Dept. of The
The Army, Mobile District, Corps of Engineers
Post Office Box 2288
Mobile, Alabama 36628-0001

FROM: State Single Point of Contact
Alabama State Clearinghouse
Planning and Economic Development Division, ADECA

SUBJECT: PLANS, STUDIES, AND OTHER DOCUMENTS--REVIEW COMPLETE**

Applicant: Mobile District, Corps of Engineers

Project: Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for navigation improvements at Bayou La Batre, Mobile County

State Application Identifier Number: OSP-050-88

The above document has been reviewed by the appropriate agencies in accordance with Executive Order No. 12372.

Any comments received from the reviewing agencies are attached. Please give any comments from our review agencies due consideration when compiling you final document.

If you need assistance, please feel free to contact us at (205) 284-8905.

OSP/05

Agencies contacted for comment:
South AL Regional Planning Commission
Conservation & Natural Resources - White
Highway Department
Historical Commission
Soil & Water Conservation
Forestry Commission
AL Dept. of Environmental Management

**PLEASE GIVE CAREFUL CONSIDERATION TO THE ATTACHED COMMENTS.

REQUEST FOR REVIEW OF PROJECT NOTIFICATION

TO: Walter Stevenson
Planning and Economic Development

Number: OSP-050-88

Applicant: Mobile District, Corps of Engineers

Project: Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for navigation improvements at Bayou La Batre, Mobile County

Date: 07/20/88

Return Prior to: 08/20/88

Please review the attached and indicate your comment with respect to plan, programs, and objectives of your agency.

Comments: (Please check one block.)

✓ No comment (This does not conflict with plans, programs, and objectives of our agency.)

Comments (Elaborate below.)

Comment here:

The EIS appears to alleviate any environmental concerns which might exist in the area.

RECEIVED

AUG 3 1988

— [illegible] —

Roger [illegible]
Signature

Please Return Original to:

ADECA - OSPFP Division
State Clearinghouse
3465 Norman Bridge Road
P. O. Box 2939
Montgomery, AL 36105-0939

JUL 21 1988

FORM CH-4

Response to Alabama Department of Economic and Community Affairs

1. Comment noted. No response required.

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
725 MONROE STREET
MONTGOMERY, ALABAMA 36130-5101

F LAWERENCE OAKS
EXECUTIVE DIRECTOR

TELEPHONE NUMBER
261-3184

July 27, 1988

Hugh A. McClellan
Acting Chief, Environment and
Resources Branch
Department of the Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, AL 36628-0001

Re: Draft Feasibility Report
and Environmental Impact Statement
for Navigation Improvements at
Bayou La Batre, AL
Mobile County, AL

Dear Mr. McClellan:

Thank you for forwarding the Draft Environmental Impact Statement for our review. As the section on cultural resources states, we concur with the dredging areas. However, we request that a cultural resource assessment be conducted for the spoil deposition area.

Should you have any questions, please contact our office.

Sincerely,

F. Lawerence Oaks

F. Lawerence Oaks
State Historic Preservation Officer

Response to Alabama Historical Commission

1. Comment noted. The survey was conducted by Mobile District archeologists on September 2, 1988. No archeological sites or historic structures were identified. The negative report of these investigations has been filed with your office and the National Park Service.

STATE OF ALABAMA
HIGHWAY DEPARTMENT
MONTGOMERY, ALABAMA 36130

GUY HUNT
GOVERNOR

ROYCE G. KING
HIGHWAY DIRECTOR

August 15, 1988

Mr. Hugh A. McClellan
Acting Chief, Environment and Resources Branch
Department of the Army
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, AL 36628-0001

ATTENTION: Coastal Environment Section

Dear Sir:

SUBJECT: Draft Feasibility Report and Environmental Impact Statement
Navigation Improvements Bayou La Batre Channel, Mobile County

The Alabama Highway Department has reviewed the subject documents. We have coordinated our review and comments with the Division Office, Federal Highway Administration, Montgomery, Alabama.

The Alabama Highway Department has no objections to the proposed improvements of the Bayou La Batre Channel. However, we would like to point out that a new lift span bridge on State Route 188 across the Bayou La Batre Channel was completed and opened to traffic in May 1984. This lift span has a vertical channel clearance of 73' and a horizontal clearance of 80'. Any significant expansion, width or depth, under and around bridge abutments at this structure should be coordinated with the Alabama Highway Department, Ninth Division Office, Mobile, Alabama.

We appreciate the opportunity to review and comment on this proposal.

Sincerely,

J. F. Caraway, Chief
Design Bureau

By: Bill G. Carwile
Bill G. Carwile, Coordinator
Environmental Technical Section

WEP/bl

cc: Mr. M. L. Risher
Mr. Jerry Peters
Mr. D. W. Vaughn
Federal Highway Administration
File (2)

STATE OF ALABAMA
HIGHWAY DEPARTMENT

GUY HUNT
GOVERNOR

NINTH DIVISION
OFFICE OF DIVISION ENGINEER
1701 BELTLINE HIGHWAY, NORTH
MOBILE, ALABAMA 36618-9988
Telephone: 470-8200

ROYCE G. KING
HIGHWAY DIRECTOR

August 26, 1988

Mr. Nathaniel D. McClure
Chief of Planning Division
P. O. Box 2288
Mobile, Alabama 36628-0001

Re: Bayou La Batre Bridge
Mobile County

Dear Mr. McClure:

As requested by Mr. Jim Vance of the U.S. Corp of Engineers, we have reviewed the proposed 75 feet x 14 feet channel under the Bayou La Batre Bridge. There appears to be no conflicts with the bridge, therefore we have no objections to the proposed channel improvements.

If further information is needed, please advise.

Yours very truly,

WL Risher
W. L. Risher
Division Engineer

Response to State of Alabama Highway Department

1. Comment noted. The proposed project has been coordinated with the Ninth Division Office and their reply is enclosed.

REQUEST FOR REVIEW OF PROJECT NOTIFICATION

TO: Mr. Richard D. Pruitt, Director
South AL Regional Planning Comm.

Number: OSP-050-88

Applicant: Mobile District, Corps of Engineers

Project: Draft Feasibility Report and Draft Environmental Impact Statement (DEIS) for navigation improvements at Bayou La Batre, Mobile County

Date: 07/20/88

Return Prior to: 08/20/88

Please review the attached and indicate your comment with respect to plan, programs, and objectives of your agency.

Comments: (Please check one block.)

[✓ No comment] (This does not conflict with plans, programs, and objectives of our agency.)

Comments (Elaborate below.)

Comment here:

RECEIVED
JUL 22 1988
[illegible]

RD Pruitt
Signature

Please Return Original to:

ADECA - OSPFP Division
State Clearinghouse
3465 Norman Bridge Road
P. O. Box 2939
Montgomery, AL 36105-0939

FORM CH-4

Response to South Alabama Regional Planning Commission

1. Comment noted. No response required.

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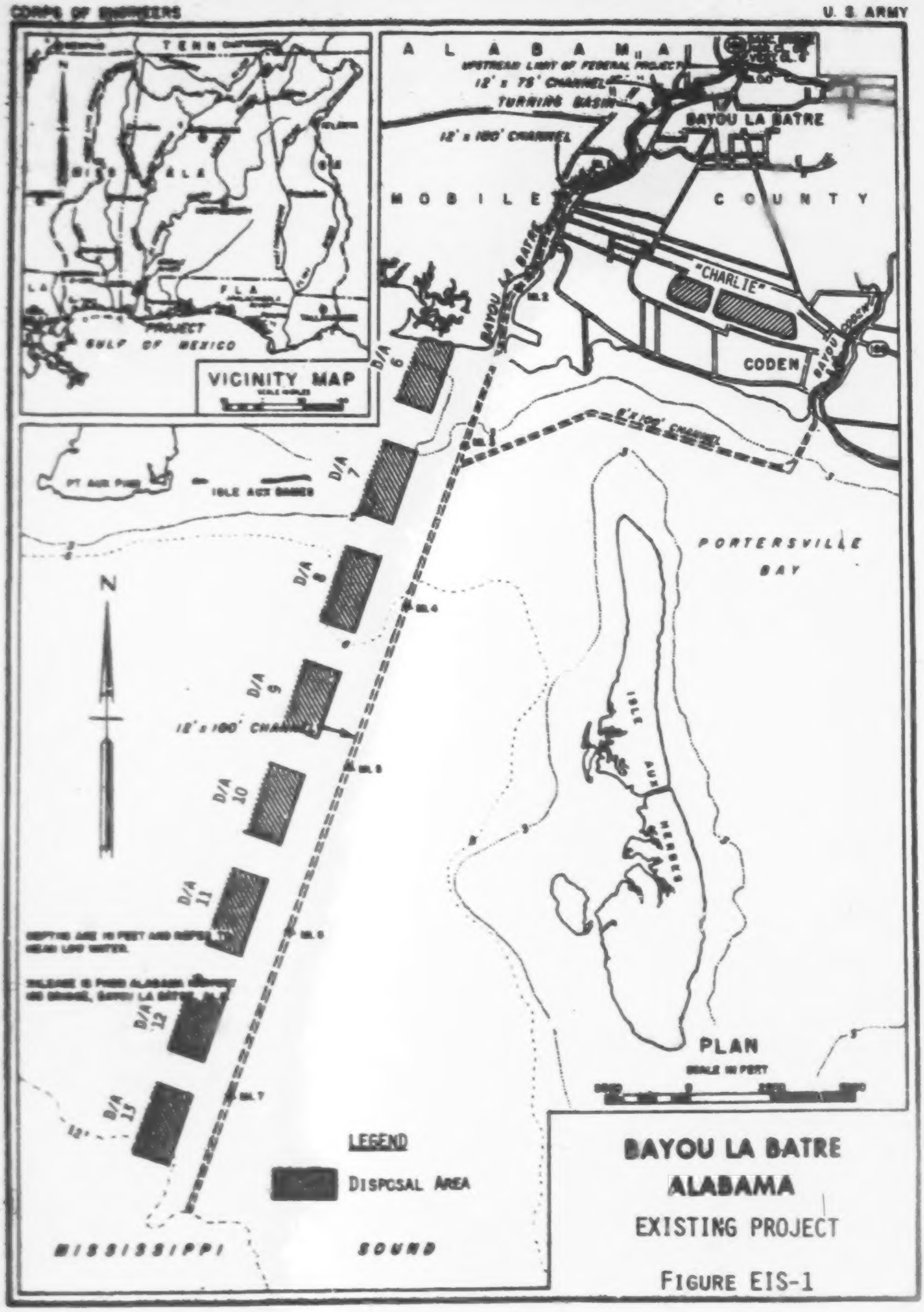
CORPS OF ENGINEERS
U. S. ARMY
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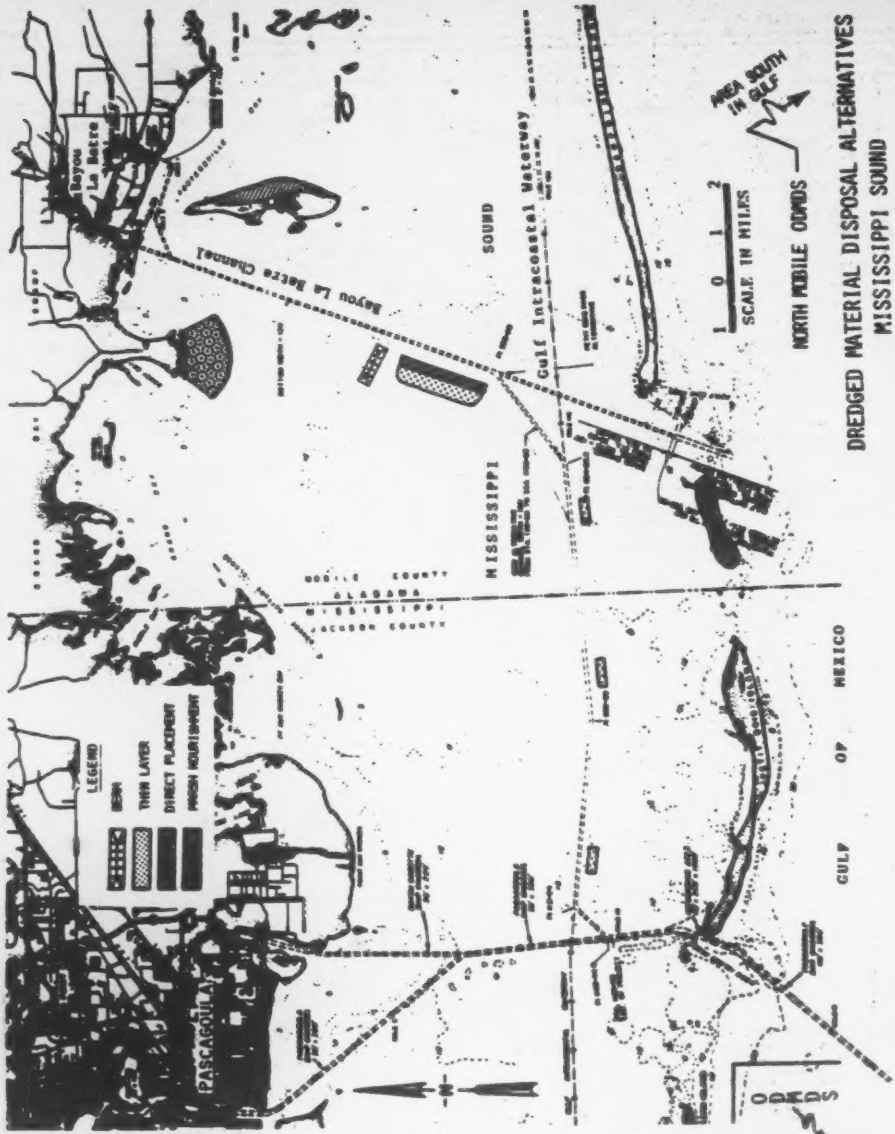
LA
FLA
PROJECT
GULF OF MEXICO
VICINITY MAP
A L A B A M A
UPSTREAM LIMIT OF FEDERAL PROJECT
12' x 75' CHANNEL
TURNING BASIN
12' x 100' CHANNEL
BAYOU LA BATRE
M O B I L E
C O U N T Y
"CHARLIE"
CODEN
BAYOU CODEN
8' x 100' CHANNEL
PT AUX PINS
ISLE AUX DAMES
PORTERSVILLE BAY
ISLE AUX HERBES
N
D/A 6
D/A 7
D/A 8
D/A 9
D/A 10
D/A 11
D/A 12
D/A 13
12' x 100' CHANNEL
DEPTHS ARE IN FEET AND REFER TO MEAN LOW WATER.
MILEAGE IS FROM ALABAMA HIGHWAY 188 BRIDGE, BAYOU LA BATRE, ALA.
PLAN
LEGEND
▨ DISPOSAL AREA
MISSISSIPPI SOUND

BAYOU LA BATRE ALABAMA

EXISTING PROJECT

FIGURE EIS-1


LEGEND
BERM
THIN LAYER
DIRECT PLACEMENT
MARSH NOURISHMENT
PASCAGOULA
Bayou La Batre
Bayou La Batre Channel
MISSISSIPPI
SOUND
Gulf Intracoastal Waterway
MOBILE COUNTY
ALABAMA
MISSISSIPPI
JACKSON COUNTY
GULF OF MEXICO
1 0 1 2
SCALE IN MILES
NORTH MOBILE ODMDS
AREA SOUTH IN GULF
ODMDS

DREDGED MATERIAL DISPOSAL ALTERNATIVES
MISSISSIPPI SOUND

FIGURE EIS-2

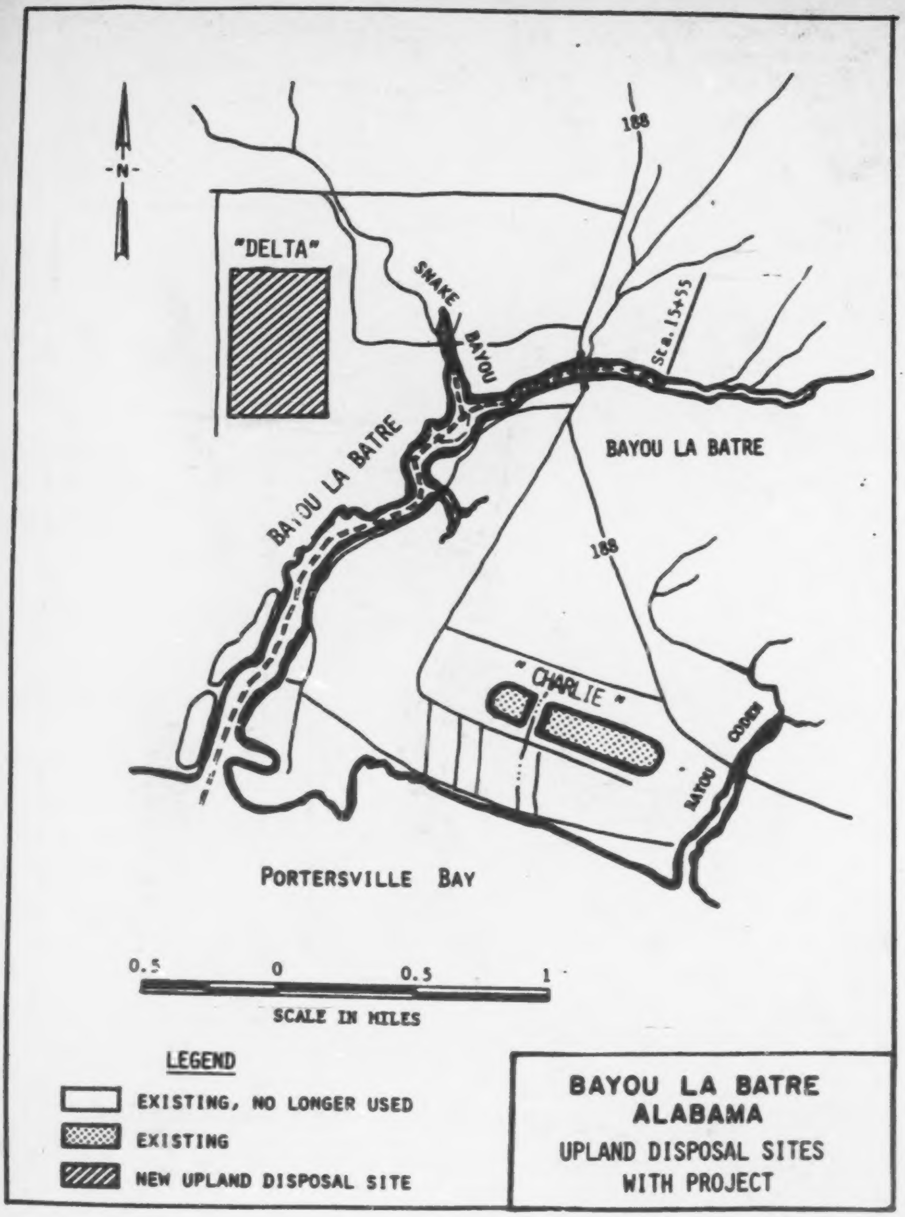
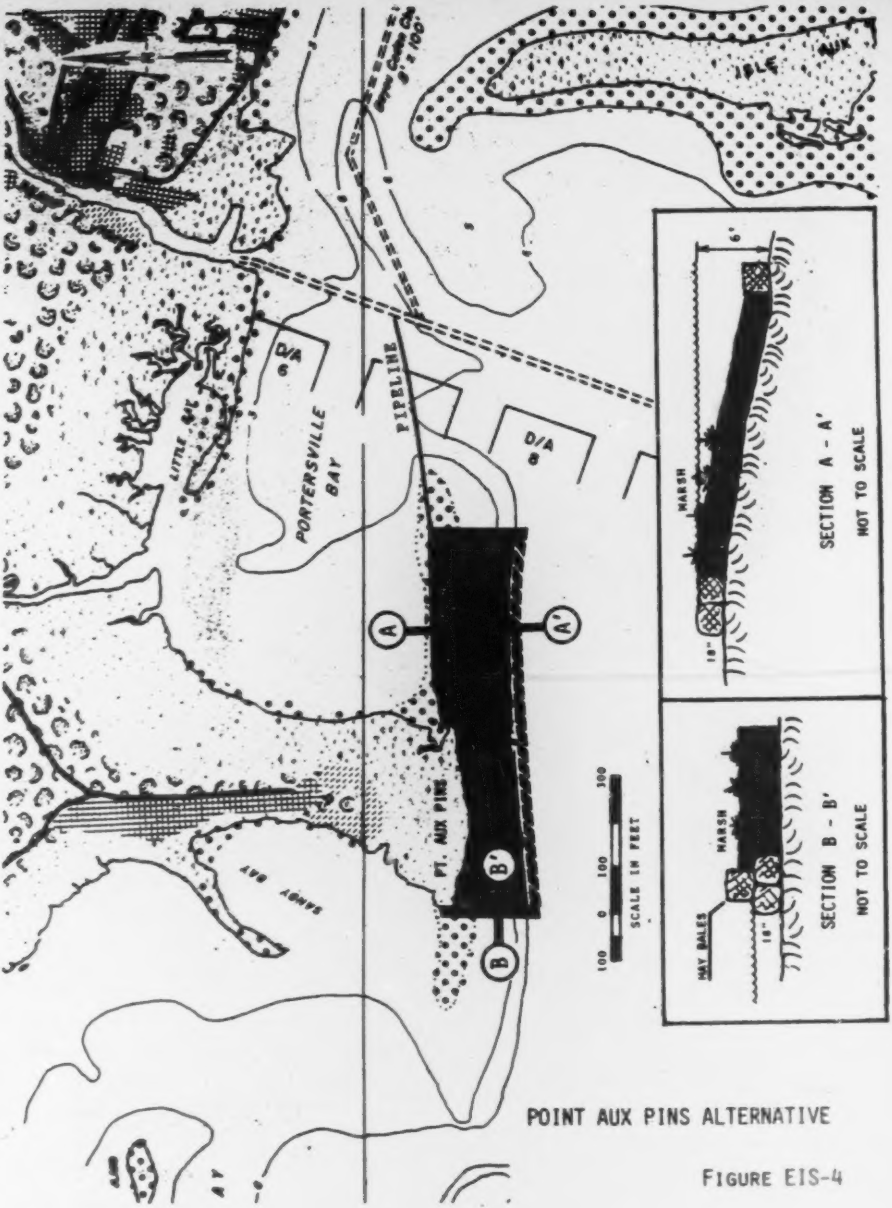
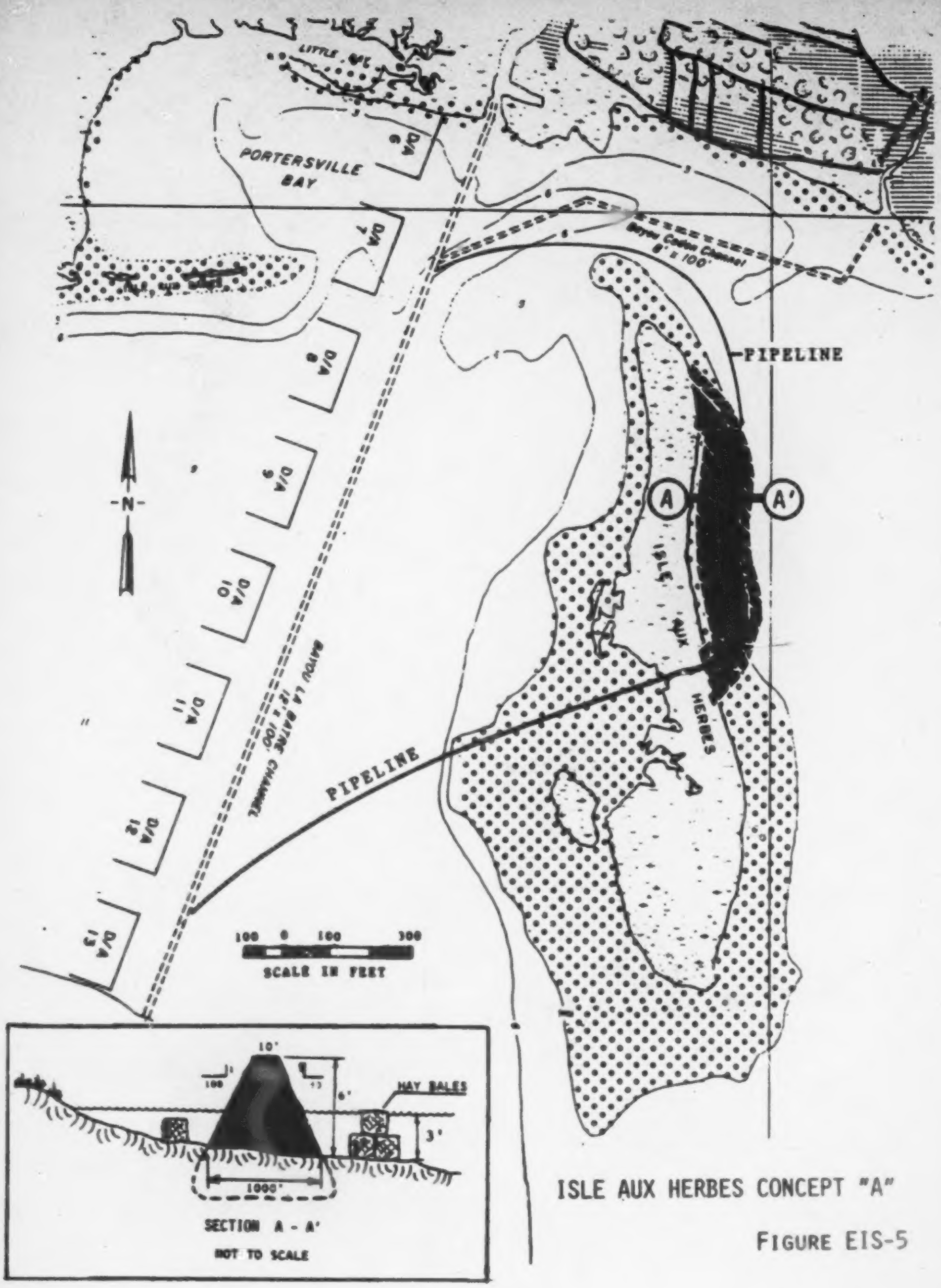

N
"DELTA"
SNAKE BAYOU
188
Sta. 15+55
BAYOU LA BATRE
BAYOU LA BATRE
188
" CHARLIE "
BAYOU CODEN
PORTERSVILLE BAY
0.5
0
0.5
1
SCALE IN MILES
LEGEND
EXISTING, NO LONGER USED
EXISTING
NEW UPLAND DISPOSAL SITE
BAYOU LA BATRE
ALABAMA
UPLAND DISPOSAL SITES
WITH PROJECT

FIGURE EIS-3


ISLE AUX
D/A 6
D/A 8
PIPELINE
PORTERSVILLE BAY
LITTLE
A
A'
B
B'
PT. AUX PINS
SANDY BAY
100 0 100 300
SCALE IN FEET
6'
MARSH
18"
SECTION A - A'
NOT TO SCALE
HAY BALES
MARSH
18"
SECTION B - B'
NOT TO SCALE

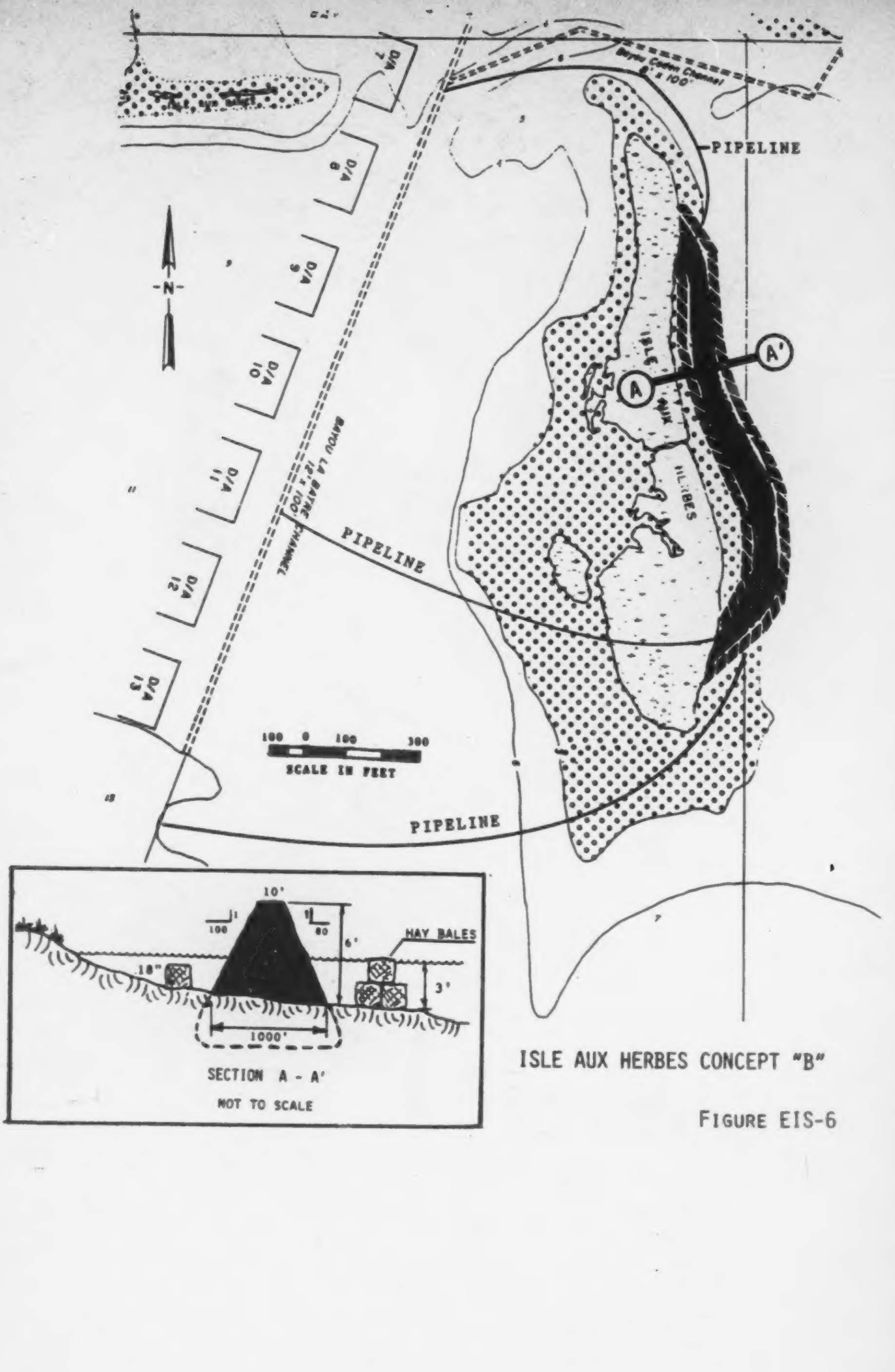
POINT AUX PINS ALTERNATIVE

FIGURE EIS-4


LITTLE BAY
PORTERSVILLE BAY
D/A 6
D/A 7
D/A 8
D/A 9
D/A 10
D/A 11
D/A 12
D/A 13
Bayou Coden Channel 8' x 100'
PIPELINE
A
A'
ISLE AUX HERBES
BAYOU LA BATRE CHANNEL 12' x 100'
-N-
PIPELINE
100 0 100 300
SCALE IN FEET
10'
1
100
1
13
6'
HAY BALES
3'
1000'
SECTION A - A'
NOT TO SCALE

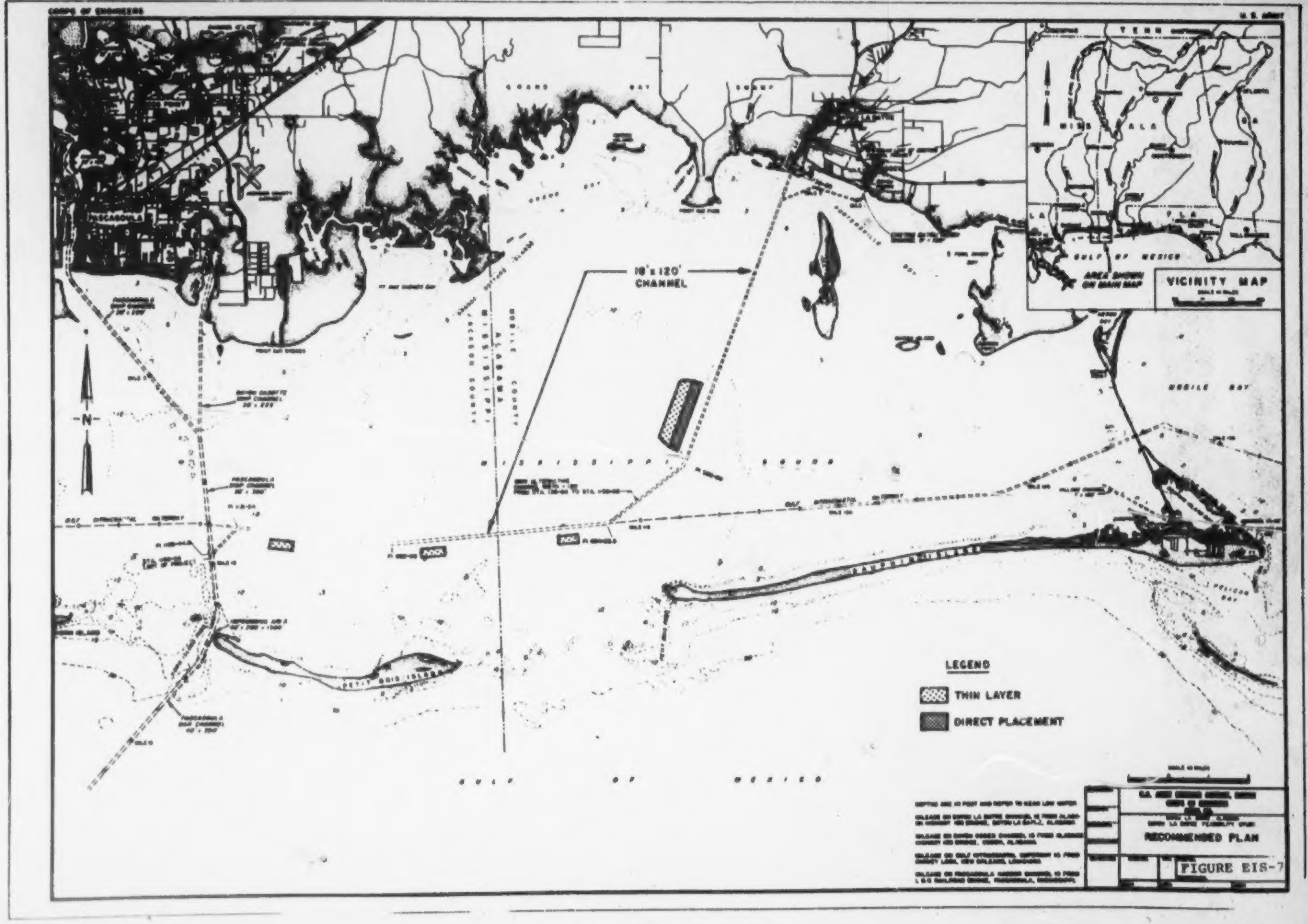
ISLE AUX HERBES CONCEPT "A"

FIGURE EIS-5


Bayou Coden Channel 8' x 100'
PIPELINE
D/A 7
D/A 8
D/A 9
D/A 10
D/A 11
D/A 12
D/A 13
N
BAYOU LA BATRE CHANNEL 12' x 100'
ISLE AUX HERBES
A
A'
PIPELINE
PIPELINE
100 0 100 300
SCALE IN FEET
10'
1
100
1
80
6'
HAY BALES
18"
3'
1000'
SECTION A - A'
NOT TO SCALE

ISLE AUX HERBES CONCEPT "B"

FIGURE EIS-6


CORPS OF ENGINEERS
U. S. ARMY
VICINITY MAP
AREA SHOWN ON MAIN MAP
GULF OF MEXICO
TENN
MISS
ALA
FLA
LA
GA
10' x 120' CHANNEL
MOBILE COUNTY
ALABAMA
MISSISSIPPI
JACKSON COUNTY
MISSISSIPPI SOUND
MOBILE BAY
PETIT BOIS ISLAND
GULF OF MEXICO
N
LEGEND
THIN LAYER
DIRECT PLACEMENT
RECOMMENDED PLAN
FIGURE EIS-7

[redacted]

[redacted]

PREFACE

As a result of the Army Corps of Engineers Washington level detailed review, it became necessary to revise the National Economic Development benefits of the project. Appendix F to the Bayou La Batre Feasibility Report contains revisions to Appendix B, Economic Analysis. The major areas of revision include the economic analyses for butterfishing, shipbuilding split operations, and shrimping.

APPENDIX F

BAYOU LA BATRE, ALABAMA
FEASIBILITY REPORT
ON
IMPROVEMENT OF THE EXISTING
FEDERAL NAVIGATION CHANNEL

ECONOMIC REANALYSES OF BUTTERFISHING, SHIPBUILDING AND SHRIMPING

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APPENDIX F

BAYOU LA BATRE, ALABAMA
FEASIBILITY REPORT
ON
IMPROVEMENT OF THE EXISTING
FEDERAL NAVIGATION CHANNEL

I. INTRODUCTION.

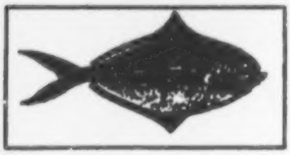
A. GENERAL. This appendix to the Bayou La Batre Feasibility Report contains revisions to Appendix B, Economic Analysis. The major areas of revision include the economic analyses for butterfishing, shipbuilding split operations, and shrimping. The revisions presented herein are the result of review and coordination between the Washington Level Review Center staff, South Atlantic Division and Mobile District Office staff, National Marine Fisheries Service, Bayou La Batre commercial fishing and shipbuilding interests, and other sources.

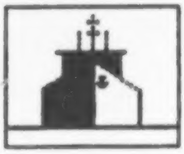
These analyses resulted in no change to the recommended plan for the project. The recommended plan is described on pages 363 and 364 of this appendix and is the same as that described on pages 98-106 of the Final Feasibility Report.

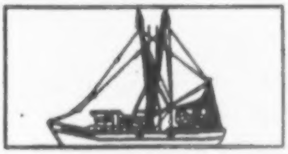
B. BUTTERFISH. The butterfish analysis has been completely revised from that presented in Appendix B. The reanalysis presented on pages 332 through 349 of this appendix, completely replaces the butterfish analysis contained on pages 186 through 190 and pages 202 and 203 of Appendix B.

C. SHIPBUILDING, SPLIT OPERATIONS. The shipbuilding split operations analysis has been totally revised over that presented in Appendix B. The reanalysis presented on pages 350 through 354 of this appendix replaces the split operations analysis contained on pages 192 through 195 of Appendix B.

D. COMMERCIAL FISHING, SHRIMP. The major revisions to the commercial fishing analysis, presented on pages 355 through 357, concern the future without and with project scenarios. Based upon information from the National Marine Fisheries Service, the shrimp catch within the Gulf of Mexico has been held constant at existing levels for future years rather than increased to the projected maximum probable catch.

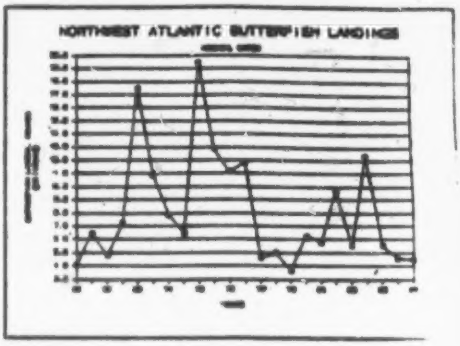






II. BUTTERFISH.

A. GENERAL. The Gulf butterfish, *Peprilus burti*, has been found to be one of the most promising latent fishery resources within the Gulf of Mexico. A commercial fishery exists in the Middle Atlantic Bight for a very similar species, the Atlantic butterfish, *Peprilus triacanthus*[1]. This butterfishing industry has included domestic fishermen from the New England coast as well as the fleets of foreign nations. Most of the Atlantic catch, which peaked at 19,454 metric tons (42.8 million pounds) in 1973, is marketed overseas, primarily in Japan. Landings of Atlantic butterfish have fluctuated greatly from year to year for reasons not well understood[2]. Thus, demand for butterfish has not always been met by the U.S. East Coast butterfish industry.



It is expected that the butterfish industry will become a significant commercial fishing activity within the Gulf of Mexico, based upon the results of research efforts conducted by the National Marine Fisheries Service (NMFS) research lab at Pascagoula, Mississippi. The objectives of the research were 1) examine the methods used in commercial butterfishing, 2) determine the availability of gulf butterfish using commercial methods, and 3) determine whether the resource could be marketed successfully[3].

The research began in the fall of 1984 with the NMFS vessel "Chapman" and the Japanese research vessel "Nisshan Maru" conducting exploratory trawling for butterfish within the Gulf Mexico. The research effort was joined by three New England commercial freezer-trawlers and a converted large shrimp trawler owned by Deep Sea Foods, Inc., of Bayou La Batre. The New

---

[1] Murawski and Waring, 1979.

[2] Murawski et al., 1978.

[3] Commercial Fishing for Gulf Butterfish, *Peprilus burti*, in the Gulf of Mexico, Vecchione, Michael, 1988.

England freezer-trawlers landed over a million pounds each year in 1986 and 1987. These butterfish were exported to Japan where they appeared to enjoy relatively good market acceptance[4]. While several gulf coast fishing companies expressed an interest in fishing for butterfish, only Deep Sea Foods, Inc. of Bayou La Batre conducted effective trials[5].

The Japanese prefer the butterfish packaged in "swim packs" in which frozen fish of uniform size are neatly arranged to make a more aesthetic display. Freshness and appearance of the product is extremely critical to successfully marketing the fish and obtaining optimum prices in Japan. Deep Sea Foods, Inc. has determined that preserving the catch in an ice slurry or refrigerated sea water, rather than freezing the fish aboard the vessel, and processing and freezing the fish at their facility at Bayou La Batre results in a product of highest quality and acceptance.

The greatest catches of Gulf butterfish were made while bottom trawling during daylight hours, as is the catch pattern for the Atlantic butterfish. It is expected that the fish aggregate close to the bottom during the day and move up in the water column during the night to feed and perhaps to spawn. It was also discovered during the test that the large catches of marketable butterfish all came from the outer continental shelf in waters deeper than 150 m, which is not trawled for the more commonly harvested species within the Gulf of Mexico. Additionally, these catches were made directly south of Bayou La Batre, east of the Mississippi River delta of Louisiana and wes of Panama City, Florida. See Figure 1.

Based upon the results of the test, NMFS estimates that, of a potential 124,000 metric ton (273 million pounds) biomass an 80 million pounds/year safe harvest of butterfish from the Gulf of Mexico could be conducted. NMFS further projects that future annual butterfish landings from the Gulf of Mexico will total 64 million pounds[6]. No predictions have been made as to how quickly the 64 million pounds/year level of harvest would be reached, as this will be largely influenced by the demand for butterfish within the world market. Fisheries experts are

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[4] The Retrofit and Butterfish Fishing of the Mister Jug, Dufrene, Ronald, December 1988.

[5] Ibid.

[6] National Marine Fisheries Service letter, January 4, 1989.

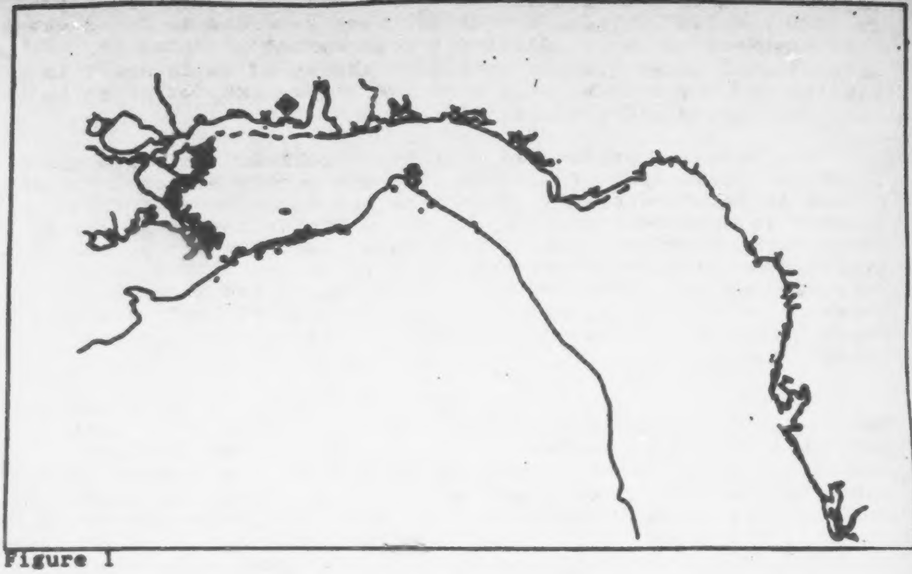


Figure 1

optimistic that the demand for butterfish will grow along with the demand of other fishery products.

The conclusions and recommendations from the Gulf butterfi test were:

- It is possible to catch Gulf butterfish in quantities and sizes which are commercially valuable.
- Commercial butterfishing in the Gulf of Mexico should concentrate on daytime bottom trawling on the outer continental shelf in waters deeper than 150 m.
- Local vessels could be rigged with relative ease to catch Gulf butterfish. Such conversions could be made so that local vessels could shrimp during part of the year and butterfish to supplement their income.
- It is expected that the Gulf butterfish of marketable size could be caught throughout a 10-month season, February through October, with the peak season for landings occurring from February to May.

- Processing the catch could be a substantial problem. Because of extended running times between deep water and ports with freezer facilities, techniques such as seawater/ice slurry are less viable as a processing option in areas with a wide continental shelf than for those areas with a relatively narrow shelf.

- Deep-water trawling a great distance from port would require large vessels of 100 feet or more. Therefore, only the largest local vessels should be considered for conversion to butterfish fishing[7]

B. EXISTING CONDITION. Commercial fishing and test trawling for Gulf butterfish continued through the 1988 season with six New England freezer-trawlers and 10 converted shrimp trawlers from the gulf fleet fishing for butterfish. Deep Sea Foods, Inc. of Bayou la Batre continued its butterfish operations with a converted shrimp trawler. No precise data are available concerning the amount of butterfish landed at Bayou La Batre during the 1988 season; however, the total amount of butterfish caught and marketed from the Gulf of Mexico was 10 to 12 million pounds. The 1988 fishing trips were also of shorter duration than in previous years, owing to increasing ability to locate schools of butterfish utilizing satellite imagery of water, surface temperature and other techniques.

The converted shrimp trawler operating out of Bayou La Batre is an 88-foot long, 12-foot draft vessel, capable of hauling 50,000 lbs. of butterfish fully loaded; however, the average catch per trip is 30,000 lbs. The average trip duration is 3 days at sea with a 3-day turnaround. The 3-day turnaround allows for unloading the vessel, repairs, resupply, crew rest, and occasional storm conditions; therefore, the vessel is capable of making 51 trips over a 10-month, 304-day, season. Since the butterfish operations currently remain in a testing phase, complete data concerning vessel operating costs and other costs of butterfishing are not available. However, Deep Sea Foods, Inc. and other data sources have been utilized to develop the following costs for existing butterfish operations.

1. Vessel Operating Costs. Table I presents the fixed and variable operating costs computed for a converted shrimp trawler butterfishing out of Bayou La Batre. These costs per vessel total $468,000 per year or $9,176 per trip based upon the capability of the vessel to make 51 trips during a 10-month butterfish season.

---

[7] Commercial Fishing for Gulf Butterfish, *Peprilus burti*, in the Gulf of Mexico, 1988, op. cit.

TABLE I
ANNUAL COSTS
CONVERTED SHRIMP TRAWLER, BUTTERFISHING
OPERATING OUT OF BAYOU LA BATRE, ALABAMA

CATCH/VESSEL/YEAR

Catch/ Trip lbs.	Number Trips/ Year*	Trip Days/ Year 3 d/trip**
30,000	51	153

* Based on 6 days/trip w/ 3-day turnaround. 304-day season.
** Based on time at sea.

VARIABLE COSTS/VESSEL/YEAR

Fuel Expense[1]	Effort Expense[2]	Crew Share[3]	Captain's Share[4]	Other Expense[5]	Total Var. Costs
$85,680	$68,850	$96,000	$32,000	$45,900	$328,430

FIXED COSTS/VESSEL/YEAR[6]

Total Fixed Costs	Percent of Total Cost	TOTAL COST/TRIP
$140,000	30%	$9,176

TOTAL COSTS : $468,430 ROUNDED : $468,000

[1] Based upon 70 hours running time per trip, 30 gal/hr, and $0.80 per gallon = $1680 per trip / 3 days per trip = $560 trip day fuel expense. Source: Deep Sea Foods, Inc.

[2] Based upon $450 per trip day. $80 per trip day from Table 6 pg. 171, includes engine repair and maintenance, boat repair, etc. $82,489 - $63,013(fuel) = $19,476 / 252 days : $80/day. Additionally, $1100 ice per trip/3 days per trip : $370/day. $370 + $80 = $450.

[3] Deep Sea Foods, Inc.

[4] Deep Sea Foods, Inc.

[5] Based upon $300 per trip day. Includes food, other supplies, and return to management.

[6] Fixed costs = 30% of total costs. Based upon U.S. International Trade Commission Report, Conditions of Competition Affecting the U.S. Gulf and Atlantic Shrimp Industry., 1985.

2. Vessel Damages. The cost of vessel damages to the converted shrimp trawler is consistent with the damages experienced by conventional, 12-foot draft, shrimp trawlers. From Table 10, page 181, Appendix B of the Final Feasibility Report for Bayou La Batre, the average yearly damages per vessel are $4,771 or about $94 per vessel trip.

3. Diver Costs. From Table 11, page 182, Appendix B of the Final Feasibility Report for Bayou La Batre, the average yearly diver costs for all 12-foot draft vessels is $43,500. There are presently 66 shrimp trawlers within the Bayou La Batre fleet which draft 12 feet; therefore, the average yearly diver cost per vessel is $659. The diver cost for the converted shrimp trawlers used for butterfishing is expected to be the same as that of a conventional shrimp trawler, $13 per vessel trip.

4. Vessel Delay Costs. The potential vessel delay costs for converted shrimp trawlers used for butterfishing was computed consistent with those of conventional shrimp trawlers. See pages 178 through 180, Appendix B, Final Feasibility Report. A 12-foot draft vessel averaged about 9 hours delay per trip during the winter months of November through February due to frequent low tides. A converted shrimp trawler used for butterfishing would make 10 trips during November and February (it is not expected that butterfishing will occur in December and January of each year) and would be delayed a total of 90 hours during those two months. Each trip would comprise 3 days or 72 hours at sea. The annual variable vessel operating costs, excluding crew and captain's share, total $200,430, see Table I The number of hours at sea each year total 3,672 (51 trips x 3 days ea. x 24 hrs/day = 3,672); therefore, the applicable variable cost per hour is $54.58. The annual vessel delay costs per converted shrimp trawler total $4,912.20 (90 hrs. x $54.58) or $96 per vessel trip.

5. Opportunity Costs to Labor. These costs are also computed consistently with the opportunity costs to labor for conventional shrimp trawlers. See pages 182 and 183, Appendix B, Final Feasibility Report. The annual crew and captain's share aboard a converted shrimp trawler used for butterfishing is $128,000 (see Table I). The hourly value of this share is $34.[illegible] ($128,000/3672 hrs. per year). At 90 hours delay per year, the opportunity costs total $3,137.40 per vessel per year or $62 per vessel trip.

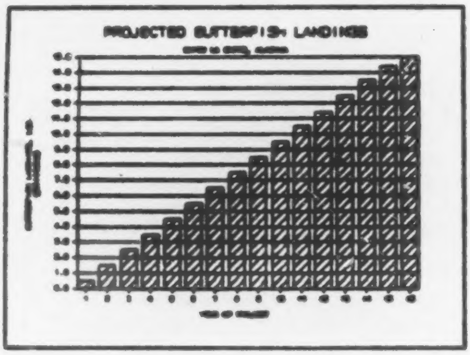
The existing condition costs associated with butterfishing with a converted shrimp trawler out of Bayou La Batre are summarized in Table II.

TABLE II
SUMMARY OF COSTS, EXISTING CONDITION
BUTTERFISHING WITH CONVERTED SHRIMP TRAWLERS
COSTS PER VESSEL PER YEAR

Vessel Operating Costs	$468,000
Vessel Damages	4,771
Diver Costs	659
Vessel Delay Costs	4,912
Opportunity Costs to Labor	3,137
TOTAL	$473,479

C. FUTURE WITHOUT PROJECT CONDITION.

1. General. The development of the future without project condition for butterfishing within the Gulf of Mexico and for Bayou La Batre incorporated the most recent and reliable data which could be obtained from the National Marine Fisheries Service, commercial fishing industry representatives, and from independent researchers. Since the butterfishing industry for the Gulf of Mexico and for Bayou La Batre is still in the development and testing phase, there is little historical data relating to operational patterns of the butterfishing industry. Therefore, the future without project condition is based upon consensus in terms of expected harvest of butterfish from the Gulf of Mexico, quantity of landings at Bayou La Batre, and the Bayou La Batre butterfish fleet operational patterns and costs. The following are the major premises used in developing the future without project condition for the butterfish industry at Bayou La Batre.



- Butterfish landings at Bayou la Batre will increase from 500,000 pounds in the first year of the project to 15 million pounds over a 15-year period and remain at that level for the remainder of the 50-year project life.

- Due to the depth restriction of the existing 12-foot channel, the Bayou La Batre butterfish industry will continue to fish with large shrimp trawlers.

- The cost to catch Gulf butterfish with large shrimp trawlers under the future without project condition will consist of the total variable and fixed vessel operating costs plus vessel damages and divor costs consistent with those of conventional shrimp vessels operating out of Bayou La Batre. Due to the 3-day turnaround and the set annual amounts of butterfish landings used in the analysis, vessel delay costs and opportunity costs to labor are not included in the costs to catch butterfish under the future without project condition.

It is expected that as the demand for butterfish increases, Bayou La Batre will lead all other gulf ports in the amount landed. This is due to several important reasons, each of which is discussed below.

- Entrepreneurship. Deep Sea Foods, Inc. in Bayou La Batre is presently leading all other gulf commercial fishing interests in conducting fishing trials, processing and in test marketing Gulf butterfish in Japan. This company is also actively involved in attempting to identify and develop new markets in addition to the traditional Japanese market. Such efforts would be expected to give Bayou La Batre a distinct advantage in the future butterfish industry.

- Location. The location which has yielded the largest and most consistent catches of marketable butterfish during the fishing trials is strategic to Bayou La Batre, directly south and along the continental shelf in waters greater than 150 m deep. See Figure 1. Additionally, the continental shelf off the Alabama coastline averages 60 statute miles in width, one of the narrowest within the Gulf of Mexico. For example, other major Gulf of Mexico commercial fishing ports and their distances from the continental shelf are: Cameron, Louisiana, 140 miles; Intercoastal City, Louisiana, 140 miles; Port Arthur, Texas, 145 miles; Aransas Pass-Rockport, Texas, 80 miles; Brownsville-Port Isabelle, Texas, 70 miles. Although the distance to the continental shelf from the ports of Aransas Pass-Rockport and Brownsville-Port Isabelle, Texas compare favorably with Bayou La Batre, no significant catches of Gulf butterfish have been made in that part of the Gulf of Mexico. In addition, the bottoms at the optimum trawling depth for butterfish in the western Gulf of Mexico are not desirable for trawling due to roughness from rock and coral.

- Processing and Cold Storage Capacity. Bayou La Batre contains the largest concentration of seafood processing infrastructure of any seafood port within the Gulf of Mexico[8]. The 57 seafood processing establishments at Bayou La Batre currently operate at approximately 55% of annual capacity[9]. This does not mean that the seafood processing interests at Bayou La Batre have grossly overbuilt processing and cold storage capacity. With additional workers and work shifts, the community has the capability, with the existing infrastructure, to process and store the 15 million pounds of butterfish projected to be landed at Bayou La Batre in future years.

2. Future Without Project Condition Costs to Catch Butterfish. As previously discussed, butterfishing out of Bayou La Batre will be conducted with the use of large shrimp trawlers of approximately 90 to 100-foot lengths and 12-foot drafts under the future without project condition. The depth restriction of the 12-foot channel would prevent economical utilization of the larger, 16-foot draft New England type vessels predicted to be used in the Gulf of Mexico as the fishery develops.

The large shrimp trawlers can be operated more economically than a large freezer/trawler type vessel on the 12-foot channel plus these vessels can also be converted and utilized for shrimping when not needed for butterfishing. This is an important consideration, especially during those years when butterfish landings at Bayou La Batre would be at levels requiring less than full utilization of some large shrimp trawlers for butterfishing. It should be noted that the large shrimp trawlers to be fully utilized for butterfishing will be new vessels added to the Bayou La Batre fleet and dedicated to butterfishing. Some existing shrimp trawlers, converted to butterfishing use, would be utilized as needed on a part-time basis to supplement the butterfish fleet in maximizing the catch The converted shrimp trawlers can be outfitted and returned to shrimping within about three days time; therefore, the fleet has a great amount of flexibility in bringing the required number of trawlers on line to accomplish the butterfish catch.

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[8] Unpublished data from Mr. Ted Flowers, National Marine Fisheries Service field representative, Bayou La Batre, September, 1987.

[9] Unpublished data from Mr. Brian Perkins, Seafood Technologist, Alabama Sea Grant Advisory Service, Mobile, Alabama, July, 1987.

The butterfish landings at Bayou La Batre are projected to increase each year from 500,000 pounds during the first year of the project, 1991, to 15 million pounds during the 16th year of the project, 2006, and stay at that level for the remaining project life. It is not inconceivable that future butterfish landings at Bayou La Batre could significantly exceed the projected 15 million pounds, especially if the 64 million pounds of landed Gulf butterfish materialize. Considering Bayou La Batre's strategic location to the most productive butterfishing area within the Gulf of Mexico and its lead in fishing technology and market research, more than a 23% market share of Gulf butterfish landings could result. The 15 million pounds, therefore, represent a conservative estimate of butterfish landings potential for Bayou La Batre but is a quantity that the community has an existing capability to process.

Table III contains the costs by year to catch butterfish out of Bayou La Batre with large shrimp trawlers under the future without project condition.

TABLE III
FUTURE WITHOUT PROJECT CONDITION
YEARLY COSTS TO CATCH BUTTERFISH UTILIZING LARGE SHRIMP TRAWLERS
BAYOU LA BATRE, ALABAMA

Year	Quantity Landed Lbs.	Vessel Trips	Vessel Operating Costs ($1000)	Vessel Damages ($1000)	Diver Costs ($1000)
1991	500,000	17	$ 156.0	$ 1.6	$ 0.2
1992	1,500,000	50	458.8	4.7	0.7
1993	2,500,000	83	761.6	7.8	1.1
1994	3,500,000	117	1,073.6	11.0	1.5
1995	4,500,000	150	1,376.4	14.1	2.0
1996	5,500,000	183	1,679.2	17.2	2.4
1997	6,500,000	217	1,991.2	20.4	2.8
1998	7,500,000	250	2,294.0	23.5	3.3
1999	8.500,000	283	2,596.8	26.6	3.7
2000	9,500,000	317	2,908.8	29.8	4.1
2001	10,500,000	350	3,211.6	32.9	4.6
2002	11,400,000	380	3,486.9	35.7	4.9
2003	12,500,000	417	3,826.4	39.2	5.4
2004	13,500,000	450	4,129.2	42.3	5.9
2005	14,400,000	480	4,404.5	45.1	6.2
2006 thru 2040	15,000,000	500	4,588.0	47.0	6.5

Table IV contains the average annual equivalent costs for butterfishing under the future without project condition.

TABLE IV
AVERAGE ANNUAL EQUIVALENT COSTS BUTTERFISHING, FUTURE WITHOUT PROJECT CONDITION

Item	Average Annual Cost
Vessel Operating Costs	$2,597,200
Vessel Damages	26,600
Diver Costs	3,700
Total Average Annual Costs	$2,627,500

D. FUTURE WITH PROJECT CONDITION.

1. General. The operational patterns, type vessels used and, consequently, the cost of butterfishing out of Bayou La Batre will vary, depending upon future amounts of butterfish landed and the depth of the channel provided under the with project condition. The following paragraphs describe what is considered to be the most likely butterfishing scenario for each channel depth investigated for the project. These scenarios are the result of a cost analysis, which incorporated various types and sizes of fishing vessels, operational patterns, and quantities of landings, performed by the Mobile District to identify the most economical method of vessel operation, and through coordination with commercial fishing interests at the project.

It is expected - and the costs analysis supports - that as butterfish landings increase in the Gulf of Mexico, the use of large vessels resembling New England type freezer-processors will enter the gulf commercial fleet. The New England freezer-processors used in the Gulf of Mexico for butterfishing measure 140' length x 32' beam x 16' draft. Commercial fishing interests at Bayou La Batre agree that vessels of this size would likely be utilized in the future provided the quantity of butterfish landings and adequate channel depth exist. It is expected that these large vessels would be utilized light-loaded with a 16-foot channel and fully loaded with an 18-foot and greater depth channel. Tables V and VI contain the fixed and variable vessel operating costs for the large New England type vessels light-loaded and fully loaded, respectively.

TABLE V
ANNUAL COSTS
BUTTERFISHING WITH NEW ENGLAND TYPE VESSEL
LIGHT-LOADED TO DRAFT 14 FEET

CATCH/VESSEL/YEAR

Catch/ Trip lbs.	Number Trips/ Year*	Days Fished/ Year 4 d/trip**
132,000	43	172

* Based on 7 days/trip w/ 3-day turnaround. 304-day season.
** Based on time at sea.

VARIABLE COSTS/VESSEL/YEAR

Fuel Expense[1]	Repairs & Maint.[2]	Other Expense[3]	Crew Share[4]	Captain's Share[5]	Total Variable Costs
$232,200	$153,080	$68,800	$135,000	$46,000	$635,080

FIXED COSTS/VESSEL/YEAR[6]

Total Fixed Costs	Percent of Total Cost	Variable Cost/Trip
$290,000	31%	$14,769

TOTAL COSTS : $925,080 ROUNDED : $925,000

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[1] Based upon $1,350 per day of fishing. Centaur Data, Exhibit 2-58, pg 2-123, ($135,000/100 days fished = $1,350/day).

[2] Based upon $890 per day of fishing. Centaur Data, Exhibit 2-58, pg 2-123, Misc. repairs($40,000) + engine maint. ($35,000) + gear maint. ($14,000) = $89,000 / 100 days fished = $890/day.

[3] Based upon $400 per day of fishing. Centaur Data, Exhibit 2-58, pg 2-123, Other variable costs and supplies ($40,000 100 days = $400/day.

[4] Based upon 25.2% of revenues. Table 6. ($86,184 / $341,550) or a maximum of $135,000 for 5 crew members (Deep Sea Foods Inc.).

[5] Based upon 11.4% of revenues. Table 6. ($38,880 / $341,550) or a maximum of $46,000 (Deep Sea Foods, Inc.).

[6] Fixed costs = 30% of total costs. Based upon U.S. International Trade Comm. Report, Conditions of Competition Affecting the U.S. Gulf and Atlantic Shrimp Industry., 1985.

TABLE VI
ANNUAL COSTS
BUTTERFISHING WITH NEW ENGLAND TYPE VESSEL
FULLY LOADED, DRAFTING 16 FEET

CATCH/VESSEL/YEAR

Catch/ Trip lbs.	Number Trips/ Year*	Days Fished/ Year 5 d/trip**
300,000	38	190

* Based on 8 days/trip w/ 3-day turnaround. 304-day season.
** Based on time at sea.

VARIABLE COSTS/VESSEL/YEAR

Fuel Expense[1]	Repairs & Maint.[2]	Other Expense[3]	Crew Share[4]	Captain's Share[5]	Total Variable Costs
$256,500	$169,100	$76,000	$150,000	$60,000	$711,600

FIXED COSTS/VESSEL/YEAR[6]

Total Fixed Costs	Percent of Total Cost	Variable Cost/Trip
$290,000	29%	$18,726

TOTAL COSTS : $1,001,600 **ROUNDED : $1,002,000**

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[1] Based upon $1,350 per day of fishing. Centaur Data, Exhibit 2-58, pg 2-123, ($135,000/100 days fished = $1,350/day).

[2] Based upon $890 per day of fishing. Centaur Data, Exhibit 2-58, pg. 2-123, Misc. repairs($40,000) + engine maint. ($35,000) + gear maint. ($14,000) = $89,000 / 100 days fished = $890/day.

[3] Based upon $400 per day of fishing. Centaur Data, Exhibit 2-58, pg 2-123, Other variable costs and supplies ($40,000 100 days = $400/day.

[4] Based upon 25.2% of revenues. Table 6. ($86,184 / $341,550) or a maximum of $150,000 for 5 crew members (Deep Sea Foods, Inc.).

[5] Based upon 11.4% of revenues. Table 6. ($38,880 / $341,550) or a maximum of $60,000 (Deep Sea Foods, Inc.).

[6] Fixed costs = 30% of total costs. Based upon U.S. International Trade Comm. Report, Conditions of Competition Affecting the U.S. Gulf and Atlantic Shrimp Industry., 1985.

The New England type vessels to be utilized by the Bayou La Batre butterfishing interests would be outfitted with holding tanks containing ice slurry or refrigerated sea water to preserve the catch. The fully loaded capacity, 300,000 pounds, of these vessels would be the same as the New England freezer-processors. The vessels would bring the catch into Bayou La Batre and utilize the existing labor force and infrastructure for processing and freezing. The relatively narrow continental shelf and the close proximity of the fishing grounds to Bayou La Batre will permit this more economical method of vessel operation while maintaining the quality of the fish required for successful marketing.

The vessel operating costs used to compute the costs to catch butterfish under each scenario were applied as follows. For the large shrimp trawlers, an average total cost - variable and fixed costs - per trip was used. Since some shrimp trawlers used for butterfishing would operate on a part-time basis and shrimp the remainder of the year, only that portion of the variable and fixed costs of the vessel while actually engaged in butterfishing was allocated toward this activity. For the New England type vessels, all of the fixed costs of each vessel was applied to butterfishing since these would be dedicated butterfish vessels and would not be used for any other activity. An average variable cost per trip was computed for these vessels and applied toward butterfishing to account for the fact that, in some years, these vessels would not operate to their full capability due to the limit of butterfish landings projected for that year.

2. 14-Foot Channel. The use of large shrimp trawlers for butterfishing will continue with a 14-foot channel. This channel depth will not permit the large New England type vessels to be utilized economically due to the degree of light-loading required to operate with the desired two feet of underkeel clearance. The $2,597,200 average annual equivalent vessel operating costs would remain; however, increased efficiencies in butterfishing would accrue to the 14-foot channel through the elimination of vessel damages and diver costs. The average annual equivalent costs eliminated by this channel depth total $30,300.

3. 16-Foot Channel. A 16-foot channel would allow the use of the large New England type vessels; however, these vessels would operate out of Bayou La Batre light-loaded to draft 14 feet in order to provide the desired two feet of underkeel clearance. Light-loading to a 14-foot draft will limit the capacity of the vessel to 132,000 pounds of fish per trip. The cost analysis performed by the Mobile District yielded the following scenario for the 16-foot channel under the future with project condition.

A large shrimp trawler will be used to land the first year's quantity of 500,000 pounds of butterfish at a cost of $156,000. Beginning the second year of the project, one large New England type vessel will come on line and make 11 trips to land the projected 1.5 million pounds of butterfish at Bayou La Batre at a cost of $452,500. This vessel will be operated light-loaded with increasing numbers of trips per year to land the projected catches of butterfish. During the seventh year, this vessel will be supplemented with one large shrimp trawler making 27 trips to land the projected 6.5 million pounds of butterfish for that year. During the eighth year, a second New England type vessel will enter the fleet. These two light-loaded New England type vessels will operate exclusively to land butterfish at Bayou La Batre until the 12th and 13th years of the project when they will be assisted with converted shrimp trawlers making five and 38 trips, respectively, for those years. During the 14th year of the project, a third New England type vessel will enter the fleet. Three of these vessels will operate light-loaded on the 16-foot deep channel with increasing numbers of trips, making a combined total of 114 trips during the 16th year and remaining years, to land 15 million pounds of butterfish at an annual operating cost of $2.6 million. Table VII contains a summary of the with project 16-foot channel butterfishing scenario.

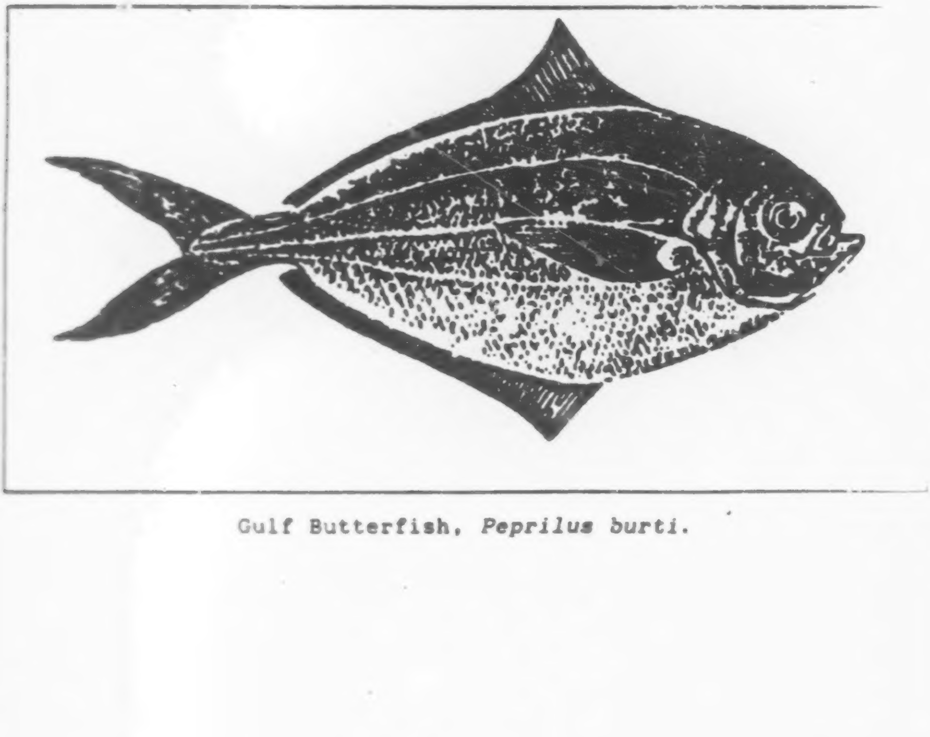
TABLE VII
BUTTERFISH LANDINGS AND COSTS
BAYOU LA BATRE, ALABAMA
16-FOOT DEEP CHANNEL

Butterfish Landings (lbs.)	No. Large Vessels	No. Large Vessel Trips	Large Vessel Costs ($1000)	No. Shrimp Vessel Trips	Shrimp Vessel Costs ($1000)	Total Costs ($1000)
500,000	0	0	$ 0.0	17	$ 156.0	$ 156
1,500,000	1	11	452.5	0	0.0	452
2,500,000	1	19	570.6	0	0.0	570
3,500,000	1	27	688.8	0	0.0	688
4,500,000	1	34	792.2	0	0.0	792
5,500,000	1	42	910.3	0	0.0	910
6,500,000	1	43	925.1	27	247.8	1,172
7,500,000	2	57	1,421.8	0	0.0	1,421
8,450,000	2	64	1,525.2	0	0.0	1,525
9,500,000	2	72	1,643.4	0	0.0	1,643
10,500,000	2	80	1,761.5	0	0.0	1,761
11,500,000	2	86	1,850.1	5	45.9	1,896
12,500,000	2	86	1,850.1	38	348.7	2,198
13,450,000	3	102	2,376.4	0	0.0	2,376
14,500,000	3	110	2,494.6	0	0.0	2,494
15,000,000	3	114	2,553.7	0	0.0	2,553

The average annual equivalent costs for butterfishing under the with project 16-foot channel is $1,498,000.

4. 18-Foot Channel. An 18-foot channel will allow the New England type vessel to operate fully loaded with 300,000 pounds of fish per trip into Bayou La Batre. The following scenario is expected in conjunction with this channel.

During the first year of the project, a large shrimp trawler will land 500,000 pounds of butterfish at Bayou La Batre at a cost of $156,000. Beginning the second year of the project, one fully loaded New England type vessel will make 5 trips to land the projected 1.5 million pounds of butterfish at a cost of $383,600. This vessel will be operated fully loaded with increasing numbers of trips per year to land the projected catches of butterfish. During the 13th year of the project, this vessel will make its full complement of 38 trips and will be supplemented with a converted shrimp trawler making 37 trips to land the projected 12.5 million pounds of butterfish at a cost of $1.3 million. During the 14th year, a second New England type vessel will come on line. Two of these vessels will operate out of Bayou La Batre, increasing the total number of trips as necessary to land the projected amounts of butterfish. During the 16th and subsequent years of the project, both of the New England type vessels will make a combined total of 50 trips to land 15 million pounds of butterfish at an annual cost of $1.5 million. Table VIII contains a summary of the with project 18-foot channel butterfishing scenario.



Gulf Butterfish, *Peprilus burti*.

TABLE VIII
BUTTERFISH LANDINGS AND COSTS
BAYOU LA BATRE, ALABAMA
18-FOOT DEEP CHANNEL

Butterfish Landings (lbs.)	No. Large Vessels	No. Large Vessel Trips	Large Vessel Costs ($1000)	No. Shrimp Vessel Trips	Shrimp Vessel Costs ($1000)	Total Costs ($1000)
500,000	0	0	$ 0.0	17	$ 156.0	$ 156.0
1,500,000	1	5	383.6	0	0.0	383.6
2,500,000	1	8	439.8	0	0.0	439.8
3,500,000	1	12	514.7	0	0.0	514.7
4,500,000	1	15	570.9	0	0.0	570.9
5,500,000	1	18	627.1	0	0.0	627.1
6,500,000	1	22	702.0	0	0.0	702.0
7,500,000	1	25	758.2	0	0.0	758.2
8,500,000	1	28	814.3	0	0.0	814.3
9,500,000	1	32	889.2	0	0.0	889.2
10,500,000	1	35	945.4	0	0.0	945.4
11,400,000	1	38	1,001.6	0	0.0	1,001.6
12,500,000	1	38	1,001.6	37	339.5	1,341.1
13,500,000	2	45	1,422.7	0	0.0	1,422
14,400,000	2	48	1,478.8	0	0.0	1,478
15,000,000	2	50	1,516.3	0	0.0	1,516

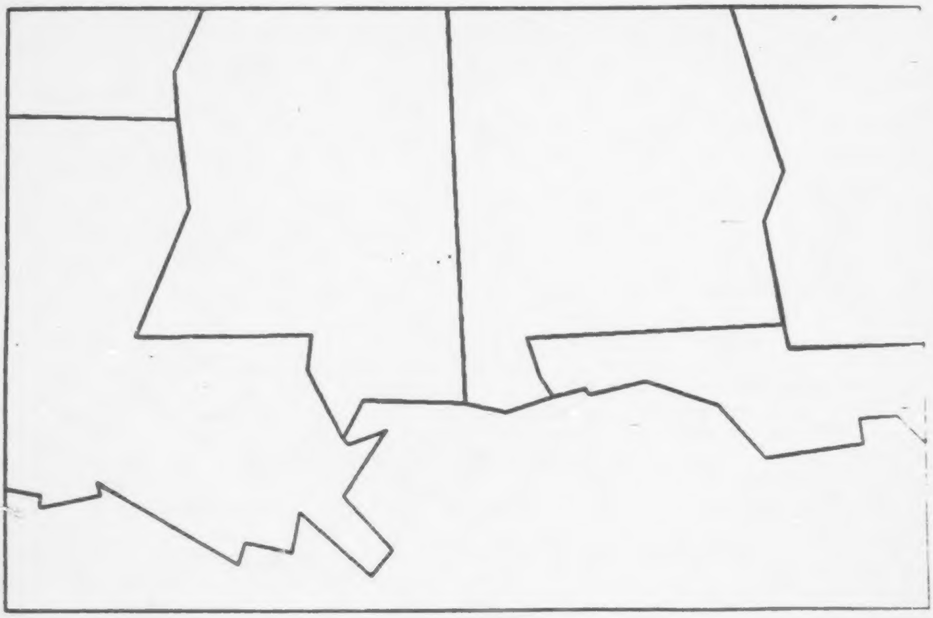
The average annual equivalent costs for butterfishing under the with project 18-foot channel is $910,300.

5. 20-Foot and 22-Foot Channels. The with project condition vessel operations and costs for butterfishing are the same for the 20-foot and 22-foot channels as described for the 18-foot channel.

6. Summary of Average Annual Costs and Benefits for Butterfish. Table VIII contains the average annual costs, average annual benefits and incremental benefits by channel depth for butterfishing out of Bayou La Batre.

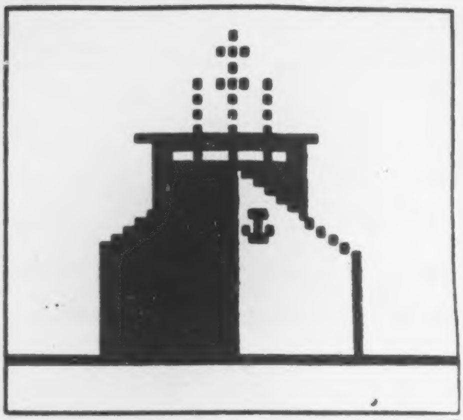
TABLE VIII
BUTTERFISH
AVERAGE ANNUAL COSTS AND BENEFITS
BAYOU LA BATRE, ALABAMA

Condition	Average Annual Costs	Average Annual Benefits	Incremental Benefits
Without Project	$2,627,500	n/a	n/a
14-foot Channel	2,597,200	30,300	30,300
16-foot Channel	1,498,000	1,129,500	1,099,200
18-foot Channel	910,300	1,717,200	587,700
20-foot Channel	910,300	1,717,200	0
22-foot Channel	910,300	1,717,200	0



III. SHIPBUILDING, SPLIT OPERATIONS.

A. GENERAL. The process of conducting split operations in shipbuilding is occasionally used by Bayou La Batre shipbuilders to construct or repair large, deep draft vessels. Deep draft vessels in this case refer to vessels that draft 16 feet or greater fully loaded. Under a split operation, the shipbuilder constructs the hull and outfits the vessel at Bayou La Batre to the fullest extent possible, then, due to the limitations of the existing 12-foot deep channel, utilizes a leased or rented yard with access to deeper water to complete construction, to outfit and to sea trial the vessel. Although several Bayou La Batre shipbuilders have successfully bid on vessel construction and repair jobs where split operations were conducted, this process involves significant cost inefficiencies in performing the work. Extra crew travel, lodging, logistics of moving heavy equipment to and from the rented yard, and some reworking of the vessel result in additional costs for vessel construction or repair.



Several Bayou La Batre shipbuilders have and continue to be asked to bid on jobs that would require that a split operation be conducted; however, alternate yards with access to deeper water are not always available. There have been occasions when Bayou La Batre shipbuilders have successfully bid on construction or repair jobs for larger vessels to be conducted under a split operation only to lose the availability of an alternate yard, resulting in forfeiture of the contract. In most instances, the Bayou La Batre shipbuilders can perform the work at a cheaper price - normally 15% to 30% less - than the contractors which obtain these jobs, due to non-unionized labor, workers that can cross skill lines, and other efficiencies within their operation. This has been demonstrated in the past from bids for construction and repair work submitted by Bayou La Batre shipbuilders.

Interviews with several major shipbuilders at Bayou La Batre have resulted in information concerning split operations being performed or attempts made to win construction and repair contracts on deeper draft vessels. Several major shipbuilders have provided future production schedules which show continuing effort to win contracts for vessel construction or repair necessitating the use of split operations. The consensus among these shipbuilders is that an increase in the number of larger vessels to be constructed and/or repaired will be required in the future in order for them to remain in the shipbuilding and repair business. The smaller vessels do not offer the unit volume of business required for them to remain profitable.

Many opportunities exist for Bayou La Batre shipbuilders to construct or repair larger vessels if a deeper channel were provided. The commercial fishing vessels utilized by the South American, Central American and Mexican fleets are rapidly growing in size and draft. Many of these vessels are large vessels used for tuna and other deep water fishing and draft up to 30 feet fully loaded. Other large vessel construction or repair work currently being performed by either foreign or domestic shipbuilders at greater costs than could be obtained at Bayou La Batre are oil supply and crew vessels as well as U.S. military and U.S. Coast Guard vessels.

B. EXISTING CONDITION. Three Bayou La Batre shipbuilders have furnished confidential financial data which provides the costs of conducting split operations for construction, servicing and repair of large vessels. In these cases, the vessel construction or repair was split between their yards in Bayou La Batre and leased yards in Pascagoula, Mississippi or Mobile, Alabama. The total cost of split operations for these three shipbuilders was $493,300. This total cost includes the costs to construct or repair large military or research type vessels and to annually service and repair large vessels used by the oil industry. These costs are listed and described for each shipbuilder in the confidential financial review package and are summarized in Table 3 of that package.

Other Bayou La Batre shipbuilders have conducted split operations in the repair or conversion of vessels; however, the costs of these split operations could not be separated out of the total repair or conversion costs contained in their records for these jobs. It was estimated by these shipbuilders that approximately 15% of the total vessel repair costs was the result of conducting a split operation and could have been saved had the vessels been repaired or outfitted completely in Bayou La Batre.

C. FUTURE WITHOUT PROJECT CONDITION. It is assured that Bayou La Batre shipbuilders will continue to compete for and win shipbuilding and repair contracts requiring split operations. The level of activity of certain split operations is expected to increase at the same rate, 1.4% annually, as that projected for general shipbuilding and repair. See Appendix B, Bayou La Batre Feasibility Report, page 205. Some activities requiring split operations are conducted on an annual basis, such as the service and repair of oil industry vessels. Due to the substantial increase in oil and natural gas exploration and production activity in Mobile Bay and the adjacent Gulf of Mexico, it is expected that split operations conducted for the servicing and repair of these vessels will increase significantly. For the purpose of this analysis, the 1.4% annual increase in the cost of these split operations is used. This is considered to be very conservative, considering the future increases in oil and gas exploration and production anticipated to occur in the vicinity. The annual costs of these split operations range - due to the 1.4% annual growth - from $284,500 in the first year of the project to $562,100 in the 50th year. The average annual equivalent cost is $334,100.

Other split operations costs incurred under the existing conditions were for the construction and repair of large military and research type vessels. Although it is not envisioned that these type vessels would be constructed or repaired on an annual basis by Bayou La Batre shipbuilders under the future without project condition, it is likely, based on past performance, that such vessel construction will occur periodically in the future. For the purpose of this analysis, it is assumed that, on the average, one large military and one very large research type vessel would be constructed or repaired every five years over the life of the project. These vessels would be similar in size and draft to vessels of this type which have been constructed or repaired at Bayou La Batre in previous years. The costs of these split operations would be $292,900 every five years resulting an average annual equivalent cost of $72,900.

The total average annual equivalent costs for split operations at Bayou La Batre under the future without project condition is $407,000.

D. FUTURE WITH PROJECT CONDITION.

1. Service and Repair of Oil Industry Vessels. A deepened channel at Bayou la Batre will reduce the costs of maintenance, repair and servicing of oil industry vessels. This activity, described under the future without project condition, is expected to increase at an average 1.4% per year over the life of the project. The total average annual equivalent cost projected for these repairs and services is $334,100. An 18-foot channel will eliminate $222,600 of the average annual cost while a 20-foot channel will eliminate $15,200 of the total. An average annual equivalent operating cost of $96,300 will remain for these operations and include costs for repair crew food, vessel transportation, and other expenses.

2. Construction and Repair of Large Vessels. As indicated through interviews conducted with Bayou La Batre

shipbuilders, the number of large vessels constructed or repaired at Bayou La Batre will increase significantly with a deeper channel. This is due to the following reasons:

- The trend, especially with South and Central American commercial fishing fleets, is toward larger and deeper draft vessels which would provide greater opportunities for Bayou La Batre shipbuilders to construct and repair these vessels.
- Increasing oil and natural gas exploration and production within Mobile Bay and the Gulf of Mexico will significantly increase the presence of large seismographic and supply vessels requiring service and repair.
- The Bayou La Batre shipbuilders will pursue the construction and repair of larger vessels more aggressively due to the availability of deeper water and the elimination of the need to conduct split operations.

Data provided by certain shipbuilders at Bayou La Batre concerning forfeited or foregone opportunities for repair contracts for deep draft vessels and are used to project the quantity of such activity under the future with project condition. In one instance, a contract for the repair of 10 foreign deep-draft commercial fishing vessels was forfeited due to the loss of the utilization of an alternate yard with access to deeper water. These vessels had a loaded draft of 30 feet and, due to the loss of stability[10], could draft no shallower than 16 feet. This $10.4[11] million contract was lost to a foreign repair yard at a price 15% higher than the Bayou La Batre bid. Although it is not expected that each major shipbuilder would experience this type and volume of work on an annual bas this contract is used as a surrogate for the total quantity of construction or repair of these size vessels that could be expected annually for all major shipbuilders at Bayou La Batre It is this difference in bid price, $1.56 million, that is used as a basis to compute increasing annual repair and construction activity for vessels requiring an 18-foot channel.

The rate of increase for the construction and repair of these type vessels under the future with project condition is

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[10] Due to the location of the center of buoyancy of the vessel, a draft less than 16 feet causes the vessel to list severely, resulting in complete loss of maneuverability.

[11] This contract was bid in a previous year. The original price has been indexed to 1988.

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1.4% annually over the 50-year life of the project, consistent with the expected increase in existing shipbuilding activity. The value of this additional shipbuilding activity ranges from $1.56 million during the first year of the project to $3.1 million during the 50th year.

E. Average Annual Costs and Benefits. At least an 18-foot deep channel will be required, due to the 16-foot vessels' draft, to eliminate a portion of the costs of split operations projected for the future without project condition. Furthermore, an 18-foot channel will be required to provide adequate depth for the additional deep draft vessels projected for construction or repair under the future with project condition. A 20-foot deep channel would be required to allow the oil tankers, which draft 18 feet loaded, to be repaired within Bayou La Batre. Table IX lists the average annual costs of split operations and resulting benefits to the 18-foot and 20-foot deep channels at Bayou La Batre.

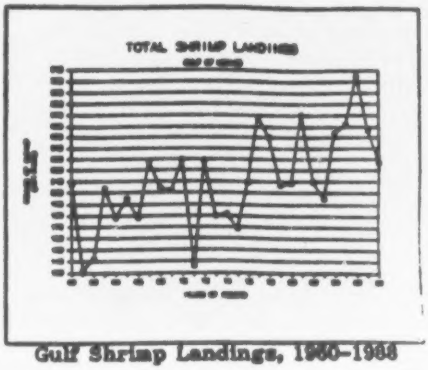
TABLE IX

SHIPBUILDING, SPLIT OPERATIONS
AVERAGE ANNUAL COSTS AND BENEFITS
18-FOOT AND 20-FOOT DEEP CHANNELS
BAYOU LA BATRE, ALABAMA

Condition	Average Annual Costs	Average Annual Incremental Benefits
Oil Vessel Service and Repair.		
Future Without Project	$ 407,000	n/a
18-foot Channel	111,500	295,500
20-foot Channel	96,300	15,200
Large Vessel Construction and Repair, Additional With Project.		
18-foot Channel	0	1,831,900
Total Average Annual Benefits (18-foot channel)		$2,127,400
Total Average Annual Benefits (20-foot channel)		15,200

IV. COMMERCIAL FISHING, SHRIMP.

A. GENERAL. Records of shrimp landings within the Gulf of Mexico over the last 30 years show significant annual variation. The annual variation is due to differing combinations of factors such as fuel prices, environmental conditions, market prices for shrimp versus other commercial species, etc. The trend, however, is that shrimp landings from the Gulf of Mexico have generally been increasing at an average rate of about two percent per year over the period 1960 through 1988. The Gulf of Mexico Fishery Management Council (GOMFMC) has projected an available 301.7 million pounds of shrimp for harvest by the gulf commercial fleet[12]. This Maximum Probable Catch (MPC) is based upon assumptions of environmental conditions and level of effort by the commercial shrimping fleet.



Gulf Shrimp Landings, 1960-1988

Some estimates project Gulf of Mexico shrimp landings increasing to the level of Maximum Probable Catch in the future and then leveling off at that amount. Other theories have been advanced which conclude that the average quantity of shrimp harvested from the Gulf of Mexico has stabilized since all trawlable bottom is currently being exploited to the fullest extent practicable. Others believe that the shrimp harvest from the Gulf of Mexico will begin an immediate decline due to the effects of diminishing marsh along the Louisiana coastline. Still others predict that, due to the erosion of marsh and the release of stored food source - detritus - into the waters of the gulf, a short term increase in shrimp landings will occur, followed by a decline over the coming years.

The National Marine Fisheries Service predicts that average shrimp landings from the Gulf of Mexico will remain relatively stable over the coming years, at a level equal to that experienced over the past five years. It is this scenario that is used to compute the revised future without project and with project costs to the Bayou La Batre commercial shrimping fleet.

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[12] Fishing Management Plan for the Shrimp Industry of the Gulf of Mexico, United States Waters, Gulf of Mexico Fishery Management Council, November 1981, pp. 4-36 through 5-9.

B. EXISTING CONDITION. The costs experienced annually by the commercial fishing fleet at Bayou La Batre is described in Appendix B of the Feasibility Report, pages 170 through 185. These costs were computed from the distribution of loaded vessel drafts - shown in Table 8B, page 178, of Appendix B - serving Bayou La Batre. The costs of fleet operations are summarized in Table 14, page 185 of Appendix B and in Table X, below.

TABLE X

EXISTING COSTS, COMMERCIAL FISHING FLEET
BAYOU LA BATRE, ALABAMA

Categories	Existing Costs
Vessel Delays	$119,200
Opportunity Costs, Labor	175,400
Vessel Damages	420,300
Diver Expenses	46,200
Additional Travel Time Via Petit Bois Pass	76,900
TOTAL EXISTING COSTS	$838,000

C. FUTURE WITHOUT PROJECT CONDITION. The shrimp landings at Bayou La Batre, as a percentage of total gulf landings, have remained remarkably consistent at a 6% market share[13]. It is expected that this trend will continue into future years; therefore, the yearly costs incurred by the Bayou La Batre commercial fishing fleet are held constant over the 50-year period of analysis. Under the future without project condition Bayou La Batre commercial fishermen will continue to experience additional costs for vessel delays, damages, opportunity costs, etc., due to the restrictions of the existing 12-foot channel. The costs per year to operate commercial fishing vessels under

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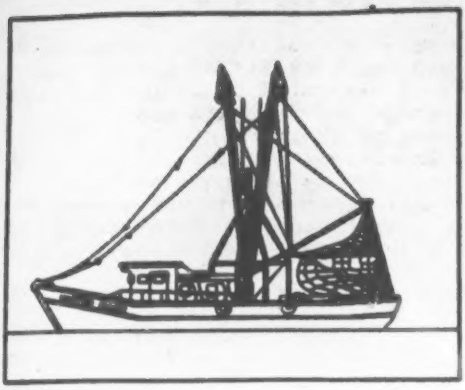
[13] Computed from data of total Gulf of Mexico and Bayou La Batre shrimp landings, provided by the National Marine Fisheries Service, Bayou La Batre, Alabama.



this condition total $838,000. As previously discussed, the scenario used in this analysis for projected shrimp landings from the Gulf of Mexico is that of a stable yield, approximating an average of annual landings over the past five years, 1984-1988.

The average annual cost inefficiencies projected for the Bayou La Batre commercial shrimping fleet under the future without project condition total $838,000.

D. FUTURE WITH PROJECT CONDITION. The amount of Bayou La Batre commercial shrimping fleet operational cost inefficiencies eliminated under the future with project condition varies with proposed channel depth, based upon the distribution of vessels' draft. The elimination of cost inefficiencies, and resulting average annual benefits, by channel depth are shown in Table XI

TABLE XI

COMMERCIAL SHRIMPING FLEET
AVERAGE ANNUAL COST INEFFICIENCIES AND BENEFITS
BAYOU LA BATRE, ALABAMA

Condition	Average Annual Cost Inefficiencies	Average Annual Benefits	Incremental Benefits
Without Project	$838,000	n/a	n/a
14-foot Channel	136,600	701,400	701,400
16-foot Channel	8,700	829,300	127,900
18-foot Channel	0	838,000	8,700
20-foot Channel	0	838,000	0
22-foot Channel	0	838,000	0

V. SUMMARY OF WITH PROJECT CONDITION COSTS AND BENEFITS.

A. GENERAL. The following generally describes the average annual equivalent costs remaining and the benefits of the various proposed channel depths and extensions evaluated under the Bayou La Batre Feasibility Study. The average annual costs and benefits contained herein are composed of those originally developed and shown in Appendix B, Economic Analysis, of the final Feasibility Report and those revised as a result of this analysis. Table XII contains the average annual equivalent costs remaining for each activity, channel depth, and for each channel extension into Snake Bayou and above the Highway 188 bridge. Table XIII lists the average annual total and incremental benefits by activity, channel depth and channel extension.

B. 14-FOOT CHANNEL. The 14-foot channel, including the extension above the Highway 188 bridge and into snake Bayou, will principally eliminate vessel damages and delays, diver costs, and opportunity costs currently experienced by the commercial shrimping fleet and those projected for the commercial butterfishing fleet. Some benefit to the shipbuilding industry would accrue to this channel depth due to elimination of vessel damages and delays for the 12-foot trawlers constructed or repaired.

C. 16-FOOT CHANNEL. The 16-foot channel would eliminate vessel damages and delays experienced by the 14-foot draft shrimp trawlers currently utilizing the existing Bayou La Batre channel. The shipbuilding industry would benefit due to the elimination vessel damages, delays and small split operations conducted at the project. Significant benefits would accrue to the projected future butterfish industry at this channel depth by allowing the use of large light-loaded New England type vessels.

D. 18-FOOT CHANNEL. The 18-foot channel would eliminate most remaining costs for the commercial shrimping and shipbuilding industries at Bayou La Batre. The benefits to the future projected butterfish industry would be maximized at this channel depth.

E. 20-FOOT AND 22-FOOT CHANNELS. The 20-foot channel would eliminate the costs to repair small tankers and large research vessels, drafting 18', at Petit Bois Island experienced by one of the Bayou La Batre shipbuilders. Since there are no remaining cost inefficiencies remaining for the 20-foot channel, the 22-foot channel benefits are the same as that for the 20-foot channel.

TABLE XII
AVERAGE ANNUAL EQUIVALENT COSTS, REMAINING BY CHANNEL DEPTH
BAYOU LA BATRE, ALABAMA
($1000)

Activity	Without Project Costs	Remaining Costs By Channel Depth				
		14'	16'	18'	20'	22'
Commercial Fishing.						
Shrimping	$ 838.0	$ 136.6	$ 8.7	$ 0.0	$ 0.0	$ 0.0
Butterfishing	2,627.5	2,597.2	1,498.0	910.3*	910.3*	910.3*
Shipbuilding, Main Channel.						
Split Operations	407.0	407.0	407.0	111.5	96.3*	96.3*
Damages, Delays	544.2	0.0	0.0	0.0	0.0	0.0
Shipbuilding.						
Snake Bayou	310.2	0.0	0.0	0.0	0.0	0.0
Above Hwy. 188	488.2	0.0	0.0	0.0	0.0	0.0

* These costs are normal operating costs not eliminated by any channel depth.

TABLE XIII
AVERAGE ANNUAL EQUIVALENT INCREMENTAL BENEFITS BY CHANNEL DEPTH
BAYOU LA BATRE, ALABAMA
($1000)

Activity	Without Project Costs	Incremental Benefits By Channel Depth				
		14'	16'	18'	20'	22'
Commercial Fishing.						
Shrimping	$ 838.0	$ 701.4	$ 127.9	$ 8.7	$ 0.0	$ 0.0
Butterfishing	2,627.5	30.3	1,099.2	587.7	0.0	0.0
Shipbuilding, Main Channel.						
Split Operations	407.0	0.0	0.0	295.5	15.2	0.0
Damages, Delays	544.2	544.2	0.0	0.0	0.0	0.0
Large Vessel Construction & Repair	0.0	0.0	0.0	1,832.0	0.0	0.0
Shipbuilding.						
Snake Bayou	310.2	310.2	0.0	0.0	0.0	0.0
Above Hwy. 188	488.2	488.2	0.0	0.0	0.0	0.0
INCREMENTAL BENEFITS		$2,074.3	$1,227.1	$2,723.9	$ 15.2	$ 0.0
TOTAL BENEFITS, BY DEPTH		$2,074.3	$3,301.4	$6,025.3	$6,040.5	$6,040.5

VI. PLAN FORMULATION.

A. GENERAL. The plan formulation methodology is described starting on page 91 of the final Feasibility Report. The alternative channel depths and alignments evaluated for the project are summarized in Tables XXIII and XXIV on pages 95 and 96, respectively, of the main report.

B. PLAN FORMULATION. Tables XIV and XV that follow contain average annual benefits for the Bayou La Batre project resulting from the revised analyses presented in this appendix, average annual costs, and resulting net benefits. The plan symbols shown in each of the tables are described on page 97 of the Main Feasibility Report. The average annual costs and benefits for the channels into Snake Bayou and above the Highway 188 bridge are also included in these tables, although the economic and environmental feasibility of these segments were evaluated independently.

TABLE XIV
ALTERNATIVE PLANS, ALL CHANNEL DEPTHS
BAYOU LA BATRE, ALABAMA

Channel Depth	Plan Symbol	Average Annual Benefits ($1000)	Average Annual Costs ($1000)	Total Net Benefits ($1000)
14 Feet	BA+SB+GA	$1,997.4	$1,660.6	$ 336.[illegible]
16 Feet	BA+SB+GA	3,224.5	2,030.7	1,193.[illegible]
18 Feet	BA+SB+GA	5,948.4	2,188.9	3,759.5
20 Feet	BA+SB+GA	5,963.6	2,490.5	3,473.[illegible]
22 Feet	BA+SB+GA	5,963.6	2,709.0	3,254.6
14 Feet	BA+SB+PA	$2,074.3	$2,274.3	$ -200.0
16 Feet	BA+SB+PA	3,301.4	2,745.6	555.[illegible]
18 Feet	BA+SB+PA	6,025.3	2,875.9	3,149.4
20 Feet	BA+SB+PA	6,040.5	3,231.9	2,808.6
22 Feet	BA+SB+PA	6,040.5	3,446.5	2,594.0

Note: The plans symbol ending with "PA" or "GA" denote alternative channel alignments through Petit Bois Pass, or along the Gulf Intracoastal Waterway (GIWW) alignment to the Pascagoula Ship Channel, respectively. See Figure 17, page 90 of main report. The difference in the average annual benefits for plans with these alignments, $76,900, is due to the reduced cost of vessel running time that alternative channels through Petit Bois Pass, the "PA" alternatives, would provide commercial fishing vessels operating due south or east of the project.

A comparison of the average annual equivalent costs and benefits associated with each alternative resulted in a clear indication that an 18-foot channel depth provided the greatest net economic benefits for the project. Therefore, further evaluation was performed on a final array of 18 alternative plans, each at the 18-foot channel depth. These 18 alternative plans for the 18-foot deep channel represent combinations of channel segments and varying construction and maintenance dredged material disposal methods. The final array of alternative plans, with the revised average annual benefits, is shown in Table XV.

TABLE XV
ALTERNATIVE PLANS, 18-FOOT CHANNEL
BAYOU LA BATRE, ALABAMA

Alternative Plan	Symbol	Average Annual Benefits ($1000)	Average Annual Costs ($1000)	Total Net Benefi ($1000
I	BA+SA+PA	$6,025.3	$2,932.1	$3,093
II	BA+SB+PA	6,025.3	2,875.9	3,149
III	BA+SC+PA	6,025.3	2,953.6	3,071
IV	BA+SD+PA	6,025.3	2,900.8	3,12
V	BA+SA+PB	6,025.3	3,055.4	2,96
VI	BA+SB+PB	6,025.3	2,999.2	3,02
VII	BA+SC+PB	6,025.3	3,076.9	2,94
VIII	BA+SD+PB	6,025.3	3,024.1	3,00
IX	BA+SE+PB	6,025.3	3,257.4	2,76
X	BA+SA+GA	$5,948.4	$2,245.1	$3,70
XI	BA+SB+GA	5,948.4	2,188.9	3,759
XII	BA+SC+GA	5,948.4	2,266.6	3,68
XIII	BA+SD+GA	5,948.4	2,213.8	3,73
XIV	BA+SE+GB	5,948.4	2,462.6	3,48
XV	BA+SA+GC	5,948.4	2,277.4	3,67
XVI	BA+SB+GC	5,948.4	2,221.2	3,72
XVII	BA+SC+GC	5,948.4	2,298.9	3,649
XVIII	BA+SD+GC	5,948.4	2,246.1	3,702

The result of the analysis shown in Table XV is that net benefits are maximized by Plan XI, with net average annual NED benefits of $3,759,500 and a benefit to cost ratio of 2.7 to The net average annual benefits, totaling $508,600, from the Snake Bayou channel and the channel improvements above the turning basin and extending above the Highway 188 bridge are included in this table.

C. **RECOMMENDED PLAN**. Based upon the results of economic, engineering and environmental analyses of over 100 alternative plans evaluated for the Bayou La Batre Feasibility Study, alternative Plan XI, with the Snake Bayou channel segment and channel improvements above the turning basin in Bayou La Batre, reasonably maximizes net NED benefits and is the recommended plan for the project. The features of this plan are:

- Deepening the existing 12' x 100' Federal channel from the mouth of Bayou La ~~Batre~~ (130+00) to the turning basin (30+00) to a navigation depth of 18 feet, plus an additional one foot for advance maintenance and one foot for allowable overdepth.

- Deepening the existing 12' x 75' Federal channel from the turning basin (30+00) to the Highway 188 bridge (0+00) to a navigation depth of 14 feet plus one foot advance maintenance and one foot allowable overdepth.

- Extending a 14' x 75' channel from the Highway 188 bridge (0+00) to Sta. -15+10 above the bridge.

- Extending a 14' x 50' channel from the intersection of Snake Bayou and Bayou La Batre at the turning basin (Sta. 0+00 Snake Bayou) into Snake Bayou to Sta. 5+33, then a 12' x channel from Sta. 5+33 to Sta. 13+47.

- Deepening, widening and extending the existing 12' x 100' Federal channel within Mississippi Sound south to connect with the Gulf Intracoastal Waterway (GIWW) alignment (536+00), then westward along the existing GIWW alignment and connecting with the existing Pascagoula Ship Channel (1185+45). The dimensions of this proposed channel are x 120' with one foot each for advance maintenance and allowable overdepth.

The construction and maintenance dredged material disposal measures incorporated with this plan are:

- New work dredged material from Snake Bayou and Bayou La Batre to Sta. 90+45 within Bayou La Batre would be disposed into a new 107-acre upland disposal area "Delta". New work dredged material from Sta. 90+45 within Bayou La Batre to the mouth (130+00) would be disposed into existing upland disposal area "Charlie". Maintenance dredged material from Snake Bayou and Bayou La Batre to Sta. 90+45 would be disposed into new upland disposal area "Delta". Maintenance dredged material from Sta. 90+45 to 155+00 would be disposed into existing upland disposal area "Charlie". See Figure 18, page 100, Main Feasibility Report.

- New work dredged material disposal from the mouth of Bayou La Batre (130+00) to the GIWW alignment (536+00) would be split between the eastern shoreline of Isle aux Herbes and direct placement into open water greater than 12 feet deep to the west of the channel. Maintenance material from this segment would be disposed in open water greater than 12 feet deep west of the channel. This maintenance material would be disposed using thin layer technique. See Figure 19, page 101, Main Feasibility Report.

- Direct placement of new work material and thin layer of maintenance dredged material from the GIWW channel segment, west to the Pascagoula Ship Channel, Sta. 536+00 to Sta. 1185+45, would be conducted in open water greater than 12 feet deep at a distance of 5,000 feet south of the channel.

STATE OF ALABAMA
DEPARTMENT OF FINANCE
MONTGOMERY, ALABAMA 36130

GUY HUNT
Governor

G. ROBIN SWIFT, JR.
Director of Finance

April 18, 1989

Colonel Larry S. Bonine
Mobile District
U.S. Army Corps of Engineers
P. O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Bonine:

We have reviewed the final Feasibility Report and the draft Local Cooperation Agreement concerning the proposed channel improvements at Bayou La Batre, Alabama. Recognizing the requirement for and the responsibilities associated with the non-Federal sponsorship, this letter is to express the intent of the State of Alabama to serve as the non-Federal sponsor for the project provided that (1) the State obtains authorization for and does in fact issue a $6,000,000 general obligation bond issue therefor, and (2) that other non-Federal interests as discussed below provide the funds for the non-Federal costs exceeding said $6,000,000.

At this time, it is contemplated that the financing of the non-Federal portion of the project will be provided in the following manner. Provided that the State of Alabama obtains authorization to issue general obligation bonds therefor, it intends to provide sixty percent (60%) of the non-Federal cost up to a maximum of $6,000,000 to construct the project. Legislation authorizing such a bond issue was introduced in the Alabama Legislature on March 28, 1989 and is currently pending consideration. The Mobile County Commission and various interests in Bayou La Batre have verbally committed to split the remaining portion of the non-Federal costs. Mobile County will likely provide its share either through general obligation bonds or from general revenues. Funding from the Bayou La Batre interests is expected through property assessments by the City of Bayou La Batre or related governmental entities or through private business contributions through the formation of a local private non-profit corporation, or a combination thereof.

The State of Alabama fully supports the proposed channel improvements at Bayou La Batre. The channel improvements described as part of the tentatively selected plan in the final Feasibility Report for the project will be of significant economic benefit to the City of Bayou La Batre, Mobile County and the State of Alabama.

Sincerely,

GRSwift, J

G. R. Swift, Jr.